

2. Shri Vaishnav Institute of Information Technology

- **Department of Computer Science & Engineering**

- Program
 - 1) B.tech (CCE)
- Sem 1

S.1 Mathematics – (BTMACS-101)

UNIT I Differential Calculus:

Limits of functions, continuous functions, uniform continuity, monotone and inverse functions. Differentiable functions, Rolle's theorem, mean value theorems and Taylor's theorem, power series. Functions of several variables, partial derivatives, chain rule, Tangent planes and normals. Maxima, minima, saddle points, Lagrange multipliers, exact differentials

UNIT II Integral Calculus:

Riemann integration, fundamental theorem of integral calculus, improper integrals. Application to length, area, volume, surface area of revolution. Multiple integrals with application to volume, surface area, Change of variables.

UNIT III Numerical Analysis:

Number Representation and Errors: Numerical Errors; Floating Point Representation; Finite Single and Double Precision Differences; Machine Epsilon; Significant Digits. **Numerical Methods for Solving Nonlinear Equations:** Method of Bisection, Secant Method, False Position, Newton-Raphson's Method, Multidimensional Newton's Method, Fixed Point Method and their convergence.

UNIT IV Numerical Methods for Solving System of Linear Equations:

Norms; Condition Numbers, Forward Gaussian Elimination and Backward Substitution; Gauss-Jordan Elimination; FGE with Partial Pivoting and Row Scaling; LU Decomposition; Iterative Methods: Jacobi, Gauss Siedal; Power method and QR method for Eigen Value and Eigenvector.

UNIT V Vector Calculus:

Gradient and directional derivative. Divergence and Curl of Vector point function, line and surface integrals. Green's, Gauss' and Stokes' theorems and their applications.

Text Books:

1. T. M. Apostol, Calculus, Volume I, 2nd Ed, Wiley, 1967.
2. T. M. Apostol, Calculus, Volume II, 2nd Ed, Wiley, 1969.
3. K. E. Atkinson, Numerical Analysis, John Wiley, Low Price Edition(2004).
4. S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 2005.
5. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

Reference Books:

1. R. G. Bartle and D. R. Sherbert, **Introduction to Real Analysis**, 5th Ed, Wiley,1999.
2. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint,2003.
3. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint,2003.
4. J. D. Hoffman, **Numerical Methods for Engineers and Scientists**, McGraw-Hill,2001.
5. M.K Jain, S.R.K Iyengar and R.K Jain, **Numerical methods for scientific and engineering computation (Fourth Edition)**, New Age International (P) Limited, New Delhi,2004.
6. S. C. Chapra, **Applied Numerical Methods with MATLAB for Engineers and Scientists**, McGraw-Hill2008.

S.2 APPLIED PHYSICS(BTPH-101)

UNIT I Quantum Physics:

Introduction to Quantum hypothesis, Matter wave concept, Wave Group and Particle velocity and their relations, Uncertainty principle with elementary proof and applications to microscope and single slit, Compton Effect, Wave function and its physical significance. Development of time dependent and time independent Schrodinger wave equation, Applications of time independent Schrodinger wave equation.

UNIT II Solid State Physics:

Free electron model, Qualitative Analysis of Kronig Penney Model, effective mass, Fermi level for Intrinsic and Extrinsic semiconductors, P-N junction diode, Zener diode, Tunnel diode, Photodiode, Solar- cells, Hall Effect, Introduction to Superconductivity, Meissner effect, Type I & II Superconductors.

UNIT III Nuclear Physics:

Nuclear Structure & Properties Nuclear models: Liquid drop with semiempirical mass formula & shell model. Particle accelerators: Cyclotron, Synchrotron, Betatron. Counters and Detectors: Giger-Muller counters, Bainbridge Mass Spectrograph and Auston Mass Spectrograph.

UNIT IV Laser & Fiber Optics:

Stimulated and Spontaneous Emission, Einstein's A&B Coefficients, Population Inversion, Pumping, Techniques of Pumping, Optical Resonator, Properties and Applications of Laser, Ruby, Nd:YAG, He-Ne lasers. Introduction to Optical fibre, Acceptance angle and cone, Numerical Aperture, V- Number, Ray theory of propagation through optical fibre, Pulse dispersion , applications of optical fibre.

UNIT V Wave Optics:

Introduction to Interference, Fresnel's Bi-prism, Interference in Thin films, Newton's rings experiment, Michelson 's interferometer and its application, Introduction to Diffraction and its Types, Diffraction at single slit, double slit, resolving power, Rayleigh criterion,

Resolving power of grating, Concept of polarized light, Double refraction, quarter and half wave plate, circularly & elliptically polarized light.

Text Books:

1. Engineering Physics by Dr. S. L. Gupta and Sanjeev Gupta, Dhanpat Rai Publication, New Delhi.
2. Engineering Physics by Navneet Gupta, Dhanpat Rai Publication, New Delhi.
3. Engineering Physics by H. J. Sawant, Technical Publications, Pune, Maharashtra.
4. Engg Physics by M.N. Avdhanulu & P.G. Kshirsagar, S.Chand & Co. Edition (2010).
5. Fundamentals of Physics by Halliday, Wiley, India.

Reference Books:

1. Concepts of Modern Physics by Beiser, TMH, New Delhi.
2. Solid State Physics by Kittel, Wiley India.
3. Atomic and Nuclear physics by Brijlal and Subramanyam.
4. LASERSs and Electro Optics by Christopher C. Davis, Cambridge Univ. Press (1996).
5. Optoelectronics an Introduction by J. Wilson & J.F.B. Hawkes, " Prentice-Hall II Edition.
6. LASER theory and applications by A. K. Ghatak & Tyagarajan, TMH (1984). 7. Optics by Ghatak, TMH.

List of Practical:

1. Measurement of radius of curvature "R" of convex lens by Newton's ring experiment.
2. Measurement of Numerical aperture of fiber by LASER.
3. Determination of Energy band gap „Eg“ of Ge using Four Probe method.
4. Measurement of Frequency of A.C. mains by electrically maintained vibrating rod.
5. Measurement of Resolving Power of Telescope.
6. Measurement of "λ" of LASER light source using Diffraction Grating.
7. Determination of Planck's constant by using photocell.
8. Determination of Energy band gap (Eg) using PN Junction Diode.
9. To determine the mass of cane sugar dissolved in water using half shade polarimeter.
10. To study forward and reverse characteristics of Zener diode.

S.3 Introduction to Computer Science and Engineering(BTCS-102)

UNIT I Introduction to Computer Fundamentals:

Introduction: What is Computer, Objectives, Hardware and software, Block Diagram of The Computer, Functions of the different Units, CPU(Central Processing Unit), Input unit, Output unit, Memory, Storage Devices, Representation of data and information, Computer Languages, Machine language, Assembly language, High level language, Number System and Conversion, Classification of Computers, History and Generations of Computer, Types of Computers, Characteristics of Computers, Introduction to Free and Open Source Software, Definition of Computer Virus, Types of Viruses, Use of Antivirus software. Applications of Computers: Home, Education and Training, Entertainment, Science, Medicine, Engineering etc.

UNIT II The Operating System:

The Graphical User Interface (GUI), Definition of Operating System, Objective, Types and functions of Operating Systems, Windows Operating System, Installing MS Windows, Working with Windows Operating System, System Tools and Applications in windows, MS-DOS (Disk Operating System), Basic DOS commands, Switching Between DOS and Windows, Comparison of DOS and Windows, System Tools and Applications in MS-DOS, Other Operating Systems Unix, Linux etc.

UNIT III Office Automation Tools-I:

Word Processing Basics, Elements of word Processing and Working, MS-Office (Word, Access, Outlook, Front page etc), Objectives, Starting MS-Word, MS-Word Screen and its Components, Working with MS-Word, Menu Bar, Creating Documents, Using Templates, Saving a documents, Working with documents, Setting up pages of a document, Printing Documents with different options, Using Tables and Columns, Object Linking and Embedding, Hyperlink, Envelopes & Label Creation, Grammar & Spell Check, Mail Merge, Macro Creation, Previewing and Printing Documents.

UNIT IV Office Automation Tools-II:

Spread Sheet: Introduction to MS-Excel, Starting MS-Excel, Basics of Workbook and Spreadsheet, MS-Excel Screen and Its Components, Features of Excel, Elementary Working with MS-Excel, Manipulation of cells, Formatting of Spreadsheet and Cells, Formulas and Functions, Spread sheets for Small accountings, Previewing and Printing a Worksheet.
Power-point: Introduction to MS-PowerPoint, Starting MS-PowerPoint, Basics of PowerPoint, MS PowerPoint Screen and Its Components, Features of PowerPoint, Elementary, Elementary Working with MS-PowerPoint, Preparation of Slides, Creation of Presentation, Providing aesthetics, Slide Manipulation and Slide Show, Presentation of the Slides.

UNIT V Computer Communication and Internet:

Computers and Communication: Introduction to Computer Networks, Internet and World Wide Web, Communication and Collaboration(Electronic Mail), Basic of electronic mail, Web Browsers and Servers, Introduction to HTML, Use of Computer in Commerce, Internet Applications, Electronic Data Interchange, Electronic Payment System, Internet Security, Privacy, Ethical Issues & Cyber Law.

Text Books:

1. E Balagurusamy , “Fundamentals of Computers ”,TMH 2009.
2. Silakari and Shukla, “Basic Computer Engineering ”, Wiley India 2011.
3. V. Rajaraman, Neeharika Adabala, “Fundamentals of Computers”, Sixth edition PHI 2015
4. Ajoy Kumar Ray and Tinku Acharya , “ Basic Computer Engineering”, PHI 2011.
5. P K Sinha ,“Fundamentals of Computers ” ,Fourth , BPB Publications, 2004. Reference

Books:

1. J. P. Tremblay and R.B. Bunt, “An Introduction of Computer Science –An Algorithmic Approach”,TMH 2015.

2. Faithe Wempen , "Computing Fundamentals: Introduction to Computers ", Wiley 2015.
3. Norton, Peter, "Introduction to Computers", Fourth revised ,Mc-Graw-Hill 2000.
4. Reema Thareja , "Fundamental of Computers", Oxford University Press, 2014.

List of Practical:

1. Study and Perform different MS –DOS Commands (Internal and External).
2. Create the "test" directory in the directory you are currently in using MS-DOS.
3. Study of Word – Templates, Styles.
4. Create a new user and give it Administrator privilege for Microsoft windows OS.
5. Create a MS-Word .doc file contain your complete CV.
6. Study and perform different Excel Commands/Functions.
7. Perform MS-Excel Accounting.
8. Create a MS-Excel .xls file contain mark sheet.
9. Display the student's result into a chart using MS-Excel.
10. Create a MS-Power Point Presentation .ppt file covers the topic “Computer's Evolution”.
11. Create a MS-Power Point Presentation .ppt file covers the topic “social responsibility”.
12. Create a MS-Access database .mdb file to store the results of students.
13. Study of various Network topologies.

S.4 Digital Logic and Circuit Design(BTEC-104)

UNIT I Number System & Codes:

Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1's Complement & 2 's Complement representation and their arithmetic operation, Floating point representation, binary codes, BCD,ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II Boolean algebra and Logic gates:

Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan's theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / Quine McCluskey method.

UNIT III Combinational logic:

Arithmetic circuits- Half adder, Full adder, Halfsubtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

UNIT IV Sequential logic:

Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V Semiconductor Memories and A/D and D/A converters:

Semiconductor Memory – RAM, ROM Organization, operation and their Types, PLD-PAL, PLA, PROM, FPGA, Analog to Digital (A/D)and Digital to Analog (D/A) converters and their types

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. S Salivahanan and S Arivazhagan: Digital Circuits and Design, 4th Edition, Vikas Publishing House, 2012.

Reference Books:

- A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI, 2016.
1. Floyd and Jain, "Digital Fundamentals", 10th Edition, Pearson Education India, 2011.
2. Roland J.Tocci, Widmer, Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson 2009.
3. Stephen Brown, Zvankovranesic, "Fundamentals of Digital Logic Design", 3rd Edition, McGraw Hill, 2017.

List of Practical:

1. To study and test of operation of all logic gates for various IC's (IC7400, IC7403, IC408, IC74332, IC7486).
2. Verification of DeMorgan's theorem.
3. To construct of half adder and full adder.
4. To construct of half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Design a BCD to excess 3 code converter.
8. Design a Multiplexer/ Demultiplexer
9. Analysis of various flip flops with Preset and Clear capability.
10. Design of Johnson and Ring counter.
11. Design of synchronous and asynchronous up/down counters.

S.5 Principles of 'C' language (BTCS-104)

UNIT I Introduction to Programming Languages:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals Of Algorithms, Flowcharts.

UNIT II Introduction to 'C' Language:

Character Set. Variables and Identifiers, Built-In Data Types. Variable Definition, Arithmetic Operators and Expressions, Constants And Literals, Simple Assignment Statement, Basic Input/Output Statement, Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement, Structured Programming.

UNIT III One Dimensional Arrays:

Array Manipulation; Searching, Insertion, Deletion of an Element from an Array; Finding the Largest/Smallest Element in an Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of a Square Matrix, Strings as Array of Characters, Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions And Pointers, Arrays And Pointers, Pointer Arrays.

UNIT IV Top-Down Approach of Problem Solving:

Modular Programming and Functions, Standard Library of C Functions, Prototype of a Function: Foolal Parameter List, Return Type, Function Call, Block Structure, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functionsand Arrays as Function Arguments Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

UNIT V Concept of Files:

File Opening in Various Modes and Closing of a File, Reading from a File, Writing onto a File.

Text Books:

1. Tennence W.Pratt, “Programming languages design and implementation”, Prentice Hall of India.
2. Allen B. Tucker, “Programming Languages”, Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH publications.
4. Balagurusamy:,”Programming with C++”, ANSI C TMH

Reference Books:

1. Roosta- Foundation of Programming Languages,Vikas
2. Jeyapoovan- A First Course in Prog with C, Vikas 8. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
3. Fundamentals of Programming Languages, R. Bangia,Cyber Tech .
4. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB

S.6 Programming Skills with 'C' (BTCS-108)

Unit - 1 Introduction to Programming:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals of Algorithms, Flow Charts.

UNIT II Programming using C:

C data types, int, char, float etc, C Expressions, Arithmetic Operation, Relational and Logic Operations, C Assignment Statements, Extension of Assignment of The Operations, C

Primitive Input Output Using getchar and putchar, Exposure to the scanf and printf functions, C Statements, conditional executing using if, else, Optionally Switch and Break Statements may be mentioned.

UNIT III Iterations and Subprograms:

Concept of loops, Example of Loops in C Using for, while and do-while, Optionally continue may be mentioned, One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations, Concept of Sub-programming, functions Example of functions, Argument passing mainly for the simple variables.

UNIT IV Pointers and Strings:

Pointers, Relationship Between Arrays and Pointers Argument passing using Pointers Array of Pointers, Passing arrays as Arguments, Strings and C String Library.Structure and Unions, Defining C structures, Passing Strings as Arguments Programming Examples.

Unit –V File handling:

Console Input Output Functions, Disk Input Output Functions, Data files, Command Line Arguments, Bitwise Operators, Enumerated Data Types, Type Casting, macros, The C Preprocessor, More About library Functions.

Reference Books:

1. E Balaguruswamy , Object Oriented Programming With C++ , 4th Edition , TMH, 2008
2. Brian W. Kernighan and Dennis M. Ritchie ,“The C Programming Language”, 2nd Edition, Prentice-Hall India, New Delhi, 2002
3. Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2000
4. H. Cooper and H. Mullish, Jaico Publishing House. “Spirit of C”, 4th Edition, Jaico Publishing House, 2006

List of Practical:

1. Write a program to produce ASCII equivalent of given number.
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user
I $(ax+b)/(ax-b)$
II $(x^5+10x^4+8x^3+4x+2)$
4. Write a program to find sum of a geometric series.
5. Write a program to cipher a string.
6. Write a program to check whether a given string follows English capitalization rules.
7. Write a program to find sum of the numerical series.
8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.
9. Write a recursive program for tower of Hanoi problem
10. The fibonacci sequence of numbers is 1,1,2,3,5,8..... Based on the recurrence relation
 - a. $F(n)=F(n-1)+F(n-2)$ for $n>2$
 - b. Write a recursive program to print the first m Fibonacci number

11. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices

- a) Addition of two matrices
- b) Subtraction of two matrices
- c) Finding upper and lower triangular matrices
- d) Trace of a matrix
- e) Transpose of a matrix
- f) Check of matrix symmetry
- g) Product of two matrices.

12. Write a program that takes two operands and one operator from the user perform the operation and then print the answer.

13. Write a program to print pyramid.

14. Write functions to add, subtract, multiply and divide two complex numbers ($x+iy$) and $(a+ib)$ Also write the main program.

15. Write a program to copy one file to other, use command line arguments.

16. Write a program to mask some bit of a number (using bit operations).

17. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

S.7 Web Development Lab-I(HTML & XML) (BTIT-307)

UNIT I Introduction to HTML:

What is HTML, HTML Documents, SGML, Basic structure of an HTML document, creating an HTML document, Headers tags, Body tags, Paragraphs formatting, Text Elements, Tag Elements, Special Character elements, Image tags, HTML Table tags and lists: Numbered list, Non- Numbered lists, Definition lists, Anchor tag, Name tag, Hyperlinks – FTP/HTTP/HTTPS, Links with images and buttons, Links to send email messages, Text fonts and styles, background colors/images, Marquee Behavior, Forms related tags. (Action, method, name, inputetc.)

UNIT II HTML5:

Introduction of HTML5, Browser supports, Migration from HTML4 to HTML5, New Elements in HTML5, HTML5 different parts layout of a web page, HTML5 Graphics: Canvas, SVG, HTML Media Tags: Inserting audio files, Inserting video files, Screen control attributes, Media control attributes, HTML Object.

UNIT III CSS:

Introduction of CSS, CSS Syntax CSS Id & Class. CSS Styling: styling Backgrounds, styling Text, styling Fonts, styling Links, styling Lists, styling Tables. CSS Box Model: Border, Outline, Margin, Padding. CSS Advanced: Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image capacity, Image Sprites, Media Types, and Attribute Selectors.

UNIT IV XML:

Introduction of XML, Cross scripting of XML, XML as intermediate language, Difference between XML and HTML, XML DOM, Tree, Syntax, Elements, Attributes, Namespaces, XPath,

XML DTD, Applications, XQuery, XML Schema, XML Parser, XHTML: Introduction of XHTML, XHTML rules over the HTML, conversation HTML to XHTML.

UNIT V Java Script:

Introduction to client side scripting, Server side scripting, Java Script Syntax, Variables and Functions, Operators: JavaScript Arithmetic Operators, JavaScript Assignment Operators, JavaScript Popup Boxes, JavaScript Window, Events and Objects, JavaScript Function Call, Validation in webpages, Introduction of AJAX

Text Books:

1. Jennifer Niederst Robbins. Learning Web Design, Fifth Edition, O'Reilly Media, Inc, May 2018.
2. Frain and Ben. Responsive Web Design with HTML5 and CSS3, Second Edition, 2015.
3. Nicholas c.Zakas. Java Script for Web Developers, Third edition, 2012.
4. George Q. Huang, K. L Mak. Internet Applications in Product Design and Manufacturing, ISBN: 3540434658, 2003 edition, springer, 2012.

Reference Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible", Fifth Edition, WileyIndia, 2010.
2. John Duckett,"Beginning HTML, XHTML, CSS, and JavaScript ",WileyIndia, 2010.
3. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design",3rd edition, Wiley India, 2011.
4. Achyut S. Godbole, Atul Kahate, Web Technologies, ISBN: 9781259062681,3rd edition, TMH, 2013.

List of Practical:

1. Design a Web Page, Insert an image on to the web page such that image is of height 300 and width 300 pixels. The image should have an ALT text in it.
2. Create a Web page that holds a bulleted list of the names of your friends. Make sure that the bullets are in plain circle.
3. Create a Frame which would hold both the web page that was created earlier. The frame should be split row-wise into equal halves.
4. Create a Web Page to display the marks you got in all subjects of last semester using table.
5. Create a Form having two boxes with labels as First Name and Last Name. The User should not be allowed to enter the names directly in the text boxes. The input has to be given in the prompt box and then entered values should be given in the textboxes.
6. Create a Web Page that has a button in the center of the page. Using mouse events change the Message in the statusbar.
7. Design a Web page that accepts Username and Password. Opens a new window when the password corresponds to a particular value is set by the developer
8. Design a Web page that consists of 2 text boxes. When the page is first loaded set the focus to the first textbox. The user should not be allowed to leave the box unless enters a value in it.
9. To convert the HTML code to XHTML code.
10. To study the XML tree.

11. To study of Dreamweaver Tool.
12. To study of a Flash Animation Tool.

- Sem 2

S.1 Mathematics-II (BTMACS-201)

UNIT I Calculus of Matrices:

Systems of linear equations and their solutions. Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices.

UNIT II Differential Equation:

Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

UNIT III Numerical Analysis Interpolation and Curve Fitting:

Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton-Gregory Polynomial Form; Lagrange Polynomial Interpolation; Approximation by Least Square Method. Numerical Differentiation and Integration: Discrete Approximation of Derivatives: Forward and Backward Difference Forms, Numerical Integration, Simple Newton-Cotes Rules: Trapezoidal and Simpson's (1/3) Rules; Weddle's Rule.

UNIT IV Numerical Solution of ODE:

Euler's Method for Numerical Solution of ODE; Modified Euler's Method; Runge-Kutta Method (RK2, RK4); Multistep Method: Predictor-Corrector method.

UNIT V Probability Theory and Random Process:

Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, Poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains.

Text Books:

1. G. Strang, **Linear Algebra And Its Applications**, 4th Edition, Brooks/Cole, 2006
2. S. L. Ross, **Differential Equations**, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, **An Introduction to Ordinary Differential Equations**, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, **Elementary Differential Equations and Boundary Value Problems**, 7th Edition, Wiley, 2001.
5. K. E. Atkinson, **Numerical Analysis**, John Wiley, Low Price Edition (2004).

6. S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 2005.
7. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley, 2005.
2. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.
3. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
4. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.
5. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, 2001.
6. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
7. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill 2008.

S.2 Computer Peripherals and Interfaces (BTCS-204)

UNIT I Memory:

Introduction to memory and its use, Memory chips and Modules: DIPP, SIPP, SIMM, DIMM, SO-DIMM, RIMM, Parity checking and ECC, ROM and its types, RAM and its types, Trouble shooting of Memory, Advanced Memory technologies: RDRAM, DDRAM, PRAM, VRAM.

UNIT II Motherboard:

Motherboard Controllers and System Resources, I/O System Bus: ISA, MCA, ELSA, VESA local bus, PCI, AGP, PCIX, Onboard I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS settings, Motherboard Form factor: AT and ATX Motherboard, LPX and NLX form factor.

UNIT III Power Supply:

Power Supply Functions and Operations, Power Supply Quality and Specifications, Power Supply and Form factors, Ventilation and Cooling: Fan, Processor cooling, Temperature limits, Power Problems and procedures, Power protection devices, Back-up power system.

UNIT IV Interfaces and I/O Ports:

Floppy Disk interface: Controller, Power cable, Control/Data cable, IDE interfaces: ATA standards, Master/Slave Configuration, Data transfer modes, SCSI interface: Bus, Standards, Hardware's, which is better SCSI or IDE, Serial ports, Parallel ports, USB, Troubleshooting.

UNIT V Device Drives and Peripherals:

Magnetic Storage: Reading/Writing, hard disk drives, Floppy disk drives, Optical Storage devices: CD-ROM drive, DVD-ROM drive, Keyboard: layouts, interfaces, Pointing devices, Mouse, Monitors, Printers, Troubleshooting of device drivers and peripherals.

Text Books:

1. **Craig Zacker & John Rourtre, PC Hardware- The complete reference, First Edition, TMH, 2017**
2. **S.K. Chauhan, PC Upgrading, maintenance and troubleshooting guide, First Edition,**
3. **B. Govindarajalu, IBM PC and CLONES: Hardware, Troubleshooting and Maintenance McGraw Hill Education, 2nd Edition 2002**
4. **Mark Minasi, The Complete PC Upgrade and Maintenance Guide, Sixteenth edition Wiley, 2005**
5. **Mike Meyers, Introduction to PC Hardware and Troubleshooting, 1st edition, McGraw Hill Education, 2017**

Reference Books:

1. **Stephen Bigelow, Bigelow's Troubleshooting, Maintaining & Repairing PCs, 5 edition, McGraw Hill Education, 2017**
2. **Manahar Lotia, Pradeep Nair, Payal Lotia, Modern Computer Hardware Course, Second Revised Edition, BPB Publications, 2007**
3. **Vikas Gupta, Comdex Hardware and Networking Course Kit: Revised & Upgraded, Dreamtech Press, 2014**
4. **Dan Gookin, Troubleshooting and Maintaining Your PC All-in-One For Dummies, 3rd edition, John Wiley & Sons, 2017**
5. **Robert Bruce Thompson, Barbara Fritchman Thompson, Building the Perfect PC, 3 edition, O'Reilly, 2010**

List of Practical:

1. To study and demonstrate the motherboard.
2. To study microprocessor and its types.
3. To study Back Power Supply: SMPS and UPS.
4. To study the Optical Drives: CD-ROM and DVD-ROM.
5. To study the working principle of keyboard and mouse.
6. To study different types ports and slots on board.
7. To study various types of Cables and their Connectors.
8. To study the working principle of monitor.
9. To study different types of printers.
10. To study the process of assembling a Motherboard.
11. To study working of Floppy Disk Drive.

S.3 Data Structure and Algorithms (BTCS-403)

UNIT I Introduction:

Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations.
Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays.
Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

UNIT II Linked List:

Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

UNIT III Stack:

The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi. The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV Tree:

Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion. Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V Sortings:

Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

Text books:

- 1.Ashok N. Kamthane, “Introduction to Data structures”, 2nd Edition, Pearson Education India,2011.
2. Tremblay & Sorenson, “Introduction to Data- Structure with applications”, 8th Edition, Tata McGrawHill,2011.
3. Bhagat Singh & Thomas Naps, “Introduction to Data structure”, 2nd Edition, Tata McGrawHill 2009.
4. Robert Kruse, “Data Structures and Program Design”,2nd Edition,PHI,1997.
5. Lipschutz Seymour,”Data structures with C” ,1st Edition ,Mc- GrawHill,2017.

Reference Books:

1. Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.

- 2. ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.**
- 3. E. Balagurusamy ,”Data Structure Using C” ,Tata McGraw-Hill 2017.**
- 4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015**
- 5. Gav Pai, Data Structures, Tata McGraw-Hill, 2015.**

List of Practical:

- 1. To develop a program to find an average of an array using AVG function.**
- 2. To implement a program that can insert, delete and edit an element in array.**
- 3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.**
- 4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.**
- 5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.**
- 6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.**
- 7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.**
- 8. Write a menu driven program to implement various operations on a linear linked list.**
- 9. Write a menu driven program to implement various operations on a circular linked list**
- 10. Program for implementation of Bubble sort**
- 11. Program for Insertion sort**
- 12. Program for Merge Sort**
- 13. Program to implement Heap sort**
- 14. Program to implement Quick sort**
- 15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it**
- 16. To develop an algorithm for binary tree operations and implement the same.**
- 17. To design an algorithm for sequential search, implement and test it.**
- 18. To develop an algorithm for binary search and perform the same.**

S.4 Computer System Organization (BTCS-404)

UNIT 1 Introduction for basic model of computer:

Brief History of computers, Von Newman architecture, Computer components, CPU, Memory, I/O, System Bus, registers, Program Counter, Accumulator, Register Transfer Language, Instruction Cycle, Instruction formats and addressing modes of basic computer. Basic arithmetic operations: addition, subtraction, multiplication, division, floating point arithmetic.

UNIT II Control Unit Organization:

Control unit operations - Address Sequencing & Micro operations, Hardwired control unit, Micro and Nano programmed control unit, Control Memory, Micro Instruction formats, Micro program sequencer, Microprogramming.

UNIT III Input Output Organization:

I/O Systems, Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, I/O processor, Introduction to 8085, 8085 I/O structure, 8085 instruction set and basic programming.

UNIT IV Memory organization:

Characteristics of Memory systems, Internal and External memories, Memory Hierarchy, High speed Memories: Cache Memory - Organization and mappings, Associative memory, Virtual memory: Segmentation, Paging, Address Translation Virtual to Physical. Secondary Storage: Magnetic Disk, Tape, DAT, RAID, Optical memory, CDROM, DVD.

UNIT V Multiprocessors:

Multiprocessor organization, Instruction level pipelining and Superscalar Processors , Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication, GPU.

Text Books:

- 1.Morris Mano, Computer System Architecture, Fourth edition, PHI, 2015.
- 2.Tanenbaum, Structured Computer Organization, First Edition, Pearson Education, 2016.
- 3.J P Hayes, Computer Architecture and Organizations, Third edition, Mc- Graw Hills, New Delhi, 2017

Reference Books:

- 1.Gaonkar, Microprocessor Architecture, Programming, Applications with 8085, fifth Edition, Prentice Hall, 2015.
- 2.William Stallings, Computer Organization and Architecture, Seventh Edition, PHI, 2009.
- 3.ISRD group, Computer Organization, Second edition, TMH, 2006.
- 4.Carter, Computer Architecture (Schaum), Third Edition, TMH, 2012.
- 5.Carl Hamacher, Computer Organization, Fifth Edition, TMH, 2002.

S.5 Object Oriented Programming (BTCS-305)

UNIT-I Introduction to OOP:

Abstract data types, Objects and classes, Attributes and Methods, Objects as software units, Encapsulation and Information hiding, Objects instantiations and interactions, Object lifetime, Static and dynamic objects, global and local objects, Metaclass, Modeling the real world objects.

UNIT-II Object and Classes:

Relationships between classes, Association of objects, Types of Association, Recursive Association, Multiplicities, Navigability, Named association, Aggregation of objects. Types of Aggregation, Delegation, Modeling Association and Aggregation.

UNIT-III OOP Concepts :

Inheritance and Polymorphism, Types of Polymorphism, Static and Dynamic Polymorphism, Operator And Method Overloading, Inherited Methods, Redefined Methods, The Protected

Interface, Abstract Methods and Classes, Public and Protected Properties, Private Operations, Multiple Inheritance.

UNIT-IV I/O and File management:

Concept of Streams, Cin and Cout Objects, C++ Stream Classes, Unformatted and Formatted I/O, Manipulators, File Stream, C++ File Stream Classes, File Management Functions, File Modes, Binary And Random Files.

UNIT-V C++/Java:

Exception Handling , TypeCasting ,Templates function and class in C++, Comparison Between C++ and Java, Features of Java ,Introduction to java, Inheritance, Interface and Abstract class in Java.

TEXT BOOKS:

1. David Parsons; Object oriented programming with C++; Second edition; BPB publication; 1997.
2. Robert Lafore; Object oriented programming in C++ ; Fourth edition ; Pearson publication;2002 .
3. E Balagurusamy; Object oriented programming with C++; Seven edition; TMH; 2017.
4. Herbert Schildt ; Java Complete Reference;Seven edition; McGrawHill; 2006 .

REFERENCES:

- 1.John R Hubbard; Programming in C++ (Schaum); Third edition; TMH; 2000.
- 2.Venugopal; Mastering C++ ; second edition ;TMH; 2006.
- 3.Steven Holzner; C++ Programming Black Book; First Edition; Coriolis Group,U.S;2001.
- 4.E Balagurusamy; Programming with java a primer; Fourth edition; TMH ; 2011.

S.6 Programming Skills with 'C++' (BTCS-208)

UNIT I:

Object Oriented Programming: Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies.

UNIT II: Tokens, Expression and controls Structures:

Tokens , Keywords, Identifiers and Constants, C++ data types,Variables: Declaration, Dynamic initialization of variables, Reference variables. Operators in C++ : Scope resolution operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. Functions: The main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III: Class and Object:

Introduction, Specifying a Class, Defining Member Functions, C++ Program with Class, Nesting of Member functions, Private Member Functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructor and Destructor: Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, and Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor, Operator overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators.

UNIT IV: Inheritance and Polymorphisms:

Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT V: I/O Operations and Files:

C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put(), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good().

Text Books:

1. E Balagurusamy, Object Oriented Programming with C++, 7Th Edition, Mc Graw Hill India, 2017.
2. Robert Lafore, Object Oriented Programming In C++, 4Th Edition, 2001.
3. David Parsons, Object Oriented Programming with C++; BPB publication, 2008.
4. Hubbard, Programming in C++ (Schaum), 3rd Edition, McGraw Hill Education, 2009.

Reference Books:

1. Herbert Schildt, The Complete Reference, 4th Edition, Tata McGraw-Hill Education Pvt. Ltd., 2000.
2. K R Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education, 2017.
3. Rajaram, R., Object Oriented Programming and C++, Second Edition, 2007
4. Saurav Sahay, Object Oriented Programming with C++, Oxford, 2006.

List of Practical:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76
2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.
3. Write a function using reference variables as arguments to swap the values of a pair of integers.
4. Write a macro that obtains the largest of 3 numbers.

5. Define a class to represent a bank account. Include the following members:

Data members

1. Name of the depositor
2. Account number
3. Type of account
4. Balance amount in the account

Member functions

1. To assign initial values
2. To deposit an amount
3. To withdraw an amount after checking the balance
4. To display name and balance

Write a main program to test the program.

7. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and odd one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

7. Design a constructor for bank account class.

8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message “Required copies not in stock” is displayed.

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.

9. Improve the system design in exercise 8 to incorporate the following features:

(a) The price of the books should be updated as and when required. Use a private member function to implement this.

(b) The stock value of each book should be automatically updated as soon as a transaction is completed.

(c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.

10. Design a C++ Class „Complex“ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

11. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class account that stores customer name, account number and type of account. From this derive the classes curacct and savacct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

a) Accept deposit from a costumer and update the balance.

b) Display the balance

- c) Compute and deposit interest.
 - d) Permit withdrawal and update the balance.
 - e) Check for the minimum balance, impose penalty, necessary and update balance.
12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it the derived class to suit their requirements.

S.7 Communication Skills (HUCS-101)

UNIT I Communication:

Nature, Meaning, Definition, Verbal and Non Verbal Communication Barriers to Communication.

UNIT II Basic Language Skills:

Grammar and usage- Parts of Speech, Tenses, S-V Agreement, Preposition, Article.

UNIT III Basic Language Skills:

Types of Sentence, Direct - Indirect, Active - Passive voice, Phrases & Clauses. UNIT IV Business Correspondence: Business Letter, Parts & Layouts of Business Resume and Job application, E-mail writing.

UNIT V Report Writing:

Importance of Report, Types of Report, Structure of a Report.

Text & Reference Books:

1. Ashraf Rizvi.(2005).Effective Technical Communication. New Delhi: Tata McGrawHill
2. Adair, John (2003). Effective Communication. London: Pan Macmillan Ltd.
3. A.J.Thomson and A.V.Martinet(1991).A Practical English Grammar(4thed). New York: Oxford IBH Pub.
4. Kratz, Abby Robinson (1995). Effective Listening Skills. Toronto: ON: Irwin Professional Publishing.
5. Prasad, H. M.(2001) How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill.
6. Pease, Allan. (1998). Body Language. Delhi: Sudha Publications.

List of Practical:

1. Self-Introduction
2. Reading Skills and Listening Skills
3. Oral Presentation
4. Linguistics and Phonetics
5. JAM (Just a Minute)

6. Group Discussion

- Sem 3

S.1 Discrete Structures (BTIT-401)

UNIT I Set Theory:

Definition Of Sets, Venn Diagrams, Complements, Cartesian Products, Power Sets, Counting Principle, Cardinality and Countability (Countable And Uncountable Sets), Proofs of Some General Identities on Sets, Pigeonhole Principle. Relation: Definition, Types of Relation, Composition of Relations, Domain and Range of a Relation, Pictorial Representation of Relation, Properties of Relation, Partial Ordering Relation. Function: Definition and Types of Function, Composition of Functions, Recursively Defined Functions.

UNIT II Propositional Logic:

Proposition Logic, Basic Logic, Logical Connectives, Truth Tables, Tautologies, Contradiction, Normal Forms (Conjunctive and Disjunctive), Modus Ponens and Modus Tollens, Validity, Predicate Logic, Universal and Existential Quantification. Notion of Proof: Proof by Implication, Converse, Inverse, Contrapositive, Negation, and Contradiction, Direct Proof, Proof by Using Truth Table, Proof by Counter Example

UNIT III Graph Theory:

Terminology Graph Representation Graph Isomorphism; Connectedness; Various Graph Properties; Euler and Hamiltonian Graph; Shortest Paths Algorithms. Trees: Terminology, Tree Traversals; Prefix Codes, Spanning Trees, Minimum Spanning Trees.

UNIT IV Algebraic Structure:

Binary Composition and its Properties Definition of Algebraic Structure; Groyas Semi Group, Monoid Groups, Abelian Group, Properties of Groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (Definition and Standard Results).

UNIT V Posets, Hasse Diagram And Lattices:

Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded and Complemented Lattices. Combinatorics: Introduction, Permutation and Combination, Binomial Theorem, Multinomial Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive Algorithms, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions, Generating Functions, Solution by Method of Generating Functions.

Text Books:

1. C.L.Liu, “Elements of Discrete Mathematics”,4th Edition, Tata McGraw-Hill, 2012.

2. Kenneth H. Rosen, "Discrete Mathematics and its applications", 7th Edition,Tata McGraw-Hill, 2012.
3. V. Krishnamurthy, "Combinatorics: Theory and Applications", 2nd Edition,East-West Press, 2008.
4. Seymour Lipschutz, M.Lipson, "Discrete Mathemataics",3rd Edition, Tata McGraw Hill, 2009.

Reference Books:

1. Trembley, J.P & Manohar; "Discrete Mathematical Structure with Application CS", Tata McGraw Hill.
2. Bisht, "Discrete Mathematics", Oxford University Press, 2015.
3. Biswal,"Discrete Mathematics & Graph Theory",3rd Edition, PHI, 2011.

S.2 Data Communication (BTCS-302)

UNIT I Introduction:

Data Communication Components, Types of Connections, Transmission Modes, Network Devices, Topologies, Protocols and Standards, OSI Model, Transmission Media, Bandwidth, Bit Rate, Bit Length, Baseband and Broadband Transmission, Attenuation, Distortion, Noise, Throughout, Delay and Jitter.

UNIT II Data Encoding:

Unipolar, Polar, Bipolar, Line and Block Codes. Multiplexing: Introduction and History, FDM, TDM, WDM, Synchronous and Statistical TDM. Synchronous and Asynchronous transmission, Serial and Parallel Transmission.

UNIT III Error Detection & Correction:

Correction, Introduction–Block Coding–Hamming Distance, CRC, Flow Control and Error Control, Stop and Wait, Error Detection and Error Go Back– N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, CSMA/CD, CDMA/CA

UNIT IV Network Switching Techniques:

Circuit, Message, Packet and Hybrid Switching Techniques.X.25, ISDN. Logical Addressing, Ipv4, Ipv6, Address Mapping, ARP, RARP, BOOTP and DHCP, User Datagram Protocol, Transmission Control Protocol, SCTP.

UNIT V Application Layer Protocols:

Domain Name Service Protocol, File Transfer Protocol, TELNET, WWW and Hyper Text Transfer Protocol, Simple Network Management Protocol, Simple Mail Transfer Protocol, Post Office Protocol v3.

Text books:

1. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw Hill, 2011.

Reference Books:

1. Larry L.Peterson, Peter S. Davie, "Computer Networks", Fifth Edition, Elsevier, 2012.
2. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2007.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top–Down Approach Featuring the Internet", Pearson Education, 2005.

S.3 Analysis and Design of Algorithms (BTIT-305)

UNIT 1 Algorithms Designing:

Algorithms, Analyzing Algorithms, Asymptotic Notations, Heap and Heap Sort, Brief Review of Graphs, Sets and Disjoint Set Union, Sorting and Searching Algorithms and their Analysis in terms of Space and Time Complexity. Divide and Conquer: General Method, Binary Search, Merge Sort, Quick Sort, Selection Sort, Strassen's Matrix Multiplication Algorithms.

UNIT II Greedy Method:

General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths. UNIT III Dynamic Programming: General Method, Optimal Binary Search Trees, O/1 Knapsack, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV Backtracking:

General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets. Branch and Bound: Method, O/1 Knapsack Problem, Traveling Salesperson Problem, Efficiency Considerations, Techniques for Algebraic Problems, Some Lower Bounds on Parallel Computations.

UNIT V NP Hard and NP Complete Problems:

Basic Concepts, Cook's Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamental of Computer Algorithms", 2 nd Edition, Galgotia Publication, 2001.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest "Introduction to Algorithms", 3 rd Edition, MIT Press, 2009.
3. Donald E Knuth, "Fundamentals of Algorithms: The Art of Computer Programming" Vol I, 3rd Edition, Pearson Education, 1997.

Reference Books:

1. Goodman, S.E. & Hedetniemi, "Introduction to Design and Analysis of Algorithm", Tata McGraw Hill, 1977.

2. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms", Tata McGraw Hill, 2006.
3. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms" TMH Publication.
4. Michael T Goodrich and Robarto Tamassia "Algorithm Design", Wiely India.

List of Practical:

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for minimum spanning trees using Kruskal's algorithm.
6. Write a program for minimum spanning trees using Prim's algorithm.
7. Write a program for single sources shortest path algorithm.
8. Write a program for Floyd-Warshall algorithm.

9. Write a program for traveling salesman problem.
10. Write a program for Hamiltonian cycle problem.

S.4 Principles of Programming Languages (BTCS-303)

UNIT I Preliminary Concepts:

Reasons for Studying, Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming, Logic Programming. Programming Language Implementation – Compilation and Virtual Machines, Programming Environments.

UNIT II Data Types:

Introduction, Primitive, Character, User Defined, Array, Associative, Record, Union, Pointer and Reference Types, Design and Implementation Uses Related to these Types. Names, Variable, Concept of Binding, Type Checking, Strong Typing, Type Compatibility, Named Constants, Variable Initialization.

UNIT III Expressions and Statements:

Arithmetic Relational and Boolean Expressions, Short Circuit Evaluation Mixed Mode Assignment, Assignment Statements, Control Structures – Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, Guarded Commands.

UNIT IV Subprograms and Blocks:

Fundamentals of Sub-Programs, Scope and Lifetime of Variable, Static and Dynamic Scope, Design Issues of Subprograms and Operations, Local Referencing Environments, Parameter Passing Methods, Overloaded Sub-Programs, Generic Sub-Programs, Design Issues for Functions Overloading and Overloaded Operators, Co-Routines.

UNIT V Abstract Data Types:

Abstractions and Encapsulation, Introductions to Data Abstraction, Static and Stack Based Storage Management. Heap Based Storage Management. Garbage Collection. Object Oriented Programming in Smalltalk, C++, Java, C#, Php, Perl. Concurrency: Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, C# Threads.

Text Books:

1. Robert .W. Sebesta —**Concepts of Programming Languages**, 10th Edition, Pearson Education,2008.
2. D. A. Watt, —**Programming Language Design Concepts**, Wiley dreamtech, rp-2007.
3. Louden and Lambart,—**Programming Languages: Principles and Practices**, 3rd Edition, Cengage Learning, 2011

Reference Books:

1. Gabbrielli and Martini —**Programming Languages: Principles and Paradigms.**, Springer, 2010.
2. Peter Sestoft,—**Programming Language Concepts**, Springer, 2017.
3. A.B. Tucker, R.E. Noonan, —**Programming Languages**, 2nd Edition, Tata McGraw Hill.
4. Terrance W Pratt, "Programming Languages: Design and Implementation" Pearson Education.

List of Practical:

1. Type compatibility rules of a C compiler.
2. Compare time efficiency to run for matrix multiplication with and without subscript range checking.
3. Investigate the safety of enumeration types. Perform at-least 5 operations to determine what incorrect or silly things are legal.
4. Calculate time efficiency for large number of references to two dimensional array between subscripting and pointer arithmetic
5. Illustrates the order of evaluation of expressions used as actual parameters to a method.
6. Consider the following programming problem: The values of three integer variables— first, second, and third—must be placed in the three variables max, mid, and min, with the obvious meanings, without using arrays or user-defined or predefined subprograms. Write two solutions to this problem, one that uses nested selections and one that does not. Compare the complexity and expected reliability of the two.
7. Produces different behavior depending on whether pass-by-reference or pass-by-value result is used in its parameter passing.
8. Write a program in some language that has both static and stack dynamic local variables in subprograms. Create six large (at least $100 * 100$) matrices in the subprogram—three static and three stack dynamic. Fill two of the static matrices and two of the stackdynamic matrices with random numbers in the range of 1 to 100. The code in the subprogram must perform a large number of matrix multiplication operations on the static matrices and time the process. Then it must repeat this with the stack-dynamic matrices. Compare and explain the results.
9. Write an abstract data type for complex numbers, including operations for addition, subtraction, multiplication, division, extraction of each of the parts of a complex number, and construction of a complex number from two floating-point constants, variables, or expressions.
10. Define semaphores in Ada and use them to provide both cooperation and competition synchronization in the shared-buffer example
11. Prepare a case study on C and C++ for Readability, Writability and. Reliability

S.5 Introduction to Core Java (BTIT-309)

UNIT I The Java Environment:

Basic History of Java and its Features, JVM, JRE and JDK, its Libraries and Functionalities, Why Java? Installing Java, Java Classes and Objects, Variables and Data Types Conditional and Looping Constructs, Arrays.

UNIT II The Java Language:

Constructors, Inheritance, Packages and Interfaces, Access Specifier, Enumerations, Auto boxing, and Annotations (Metadata) Garbage collection, Nested Classes, Inner Classes

UNIT III Performance:

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, The Idea Behind Exception, Exceptions and Errors, Types of Exception, Control Flow in Exceptions, JVM Reaction to Exceptions, Use of Try, Catch, Finally, Throw, Throws in Exception Handling, In-Built and User Defined Exceptions, Checked and Un Checked Exceptions, Generics, Lambda Expressions.

UNIT IV The Java Library:

String Handling, Exploring Java.Lang, Java.Util – The Collection Framework, Exploring Java.IO, Exploring Java. NIO.

UNIT V Database Connectivity with JDBC:

Introduction to JDBC, JDBC Drivers & Architecture, CRUD Operation using JDBC

Text Books:

1. Kishore Sharan, “Beginning Java 8 Language Features”, Apress, 2014
2. E. Balagurusamy, “Programming with java A Primer”, Fourth Edition, Tata McGraw Hill, 2009.
3. Sharanam Shah, “Core Java 8 for Beginners”, Shroff Publisher, 2015.

Reference Books:

1. Herbert Schildt, “The Complete Reference Java”, Ninth Edition, McGraw Hill, 2014
2. Bert Bates, Kathy Sierra, “Head First Java”, 2nd Edition, O’ Reilly, 2005
3. Cay S Horstman and Gary Cornell, “Core Java”, Vol I & II, Pearson Education, 2013

List of Practical:

1. Write a program to show concept of Class in Java?
2. Write a program showing Type Casting
3. Write a program showing Different type of inheritance
4. Write a program showing Different types of Polymorphism
5. Write a program showing Encapsulation
6. Write a program showing Abstraction
7. Write a Multithreaded program
8. Write a program showing Checked and Unchecked Exception

9. Write a program showing Database connectivity.

10. Write a program showing Simple database Operation (CRUD)

S.6 Technical Presentation Skills (BTCS-610)

COURSE CONTENTS:

Note taking from reference material , Precise writing , Slide preparation and oral presentation principles, Written presentation of technical material , Preparation of Bibliography , Basics of Official Correspondence , Preparation of curriculum vitae , Students should be asked to prepare and give presentation during the semester.

COURSE OUTCOMES Upon completion of the subject, students will be able to:

1. Ability to review, prepare and present technological developments.
2. Ability to face the placement interviews.
3. Ability to effectively communicate technical material in print.
4. Ability to present technical material orally with confidence and poise.
5. Ability to present technical material using audiovisual materials.
6. Ability to communicate technical material to a variety of audiences, from members of the building and engineering trades and medical fields to government representatives and the general public.
7. Ability to work well in teams.

TEXT BOOKS:

1. The Chicago Manual of Style, 13th Edition, Prentice Hall of India 1989.
2. Gowers Ernest, "The Complete Plan in Words" Penguin, 1973.
3. Menzel D.H., Jones H.M, Boyd, LG., "Writing a Technical Paper". McGraw Hill, 1961.
4. Strunk, W., & White E.B., "The Elements of Style", 3rd Edition , McMillan, 1979.

REFERENCES:

1. Turbian K.L., "A Manual for Writers of Term Papers, Thesis and dissertations" Univ of Chicago Press, 1973.
2. IEEE Transactions on "Written and Oral Communication" has many papers

S.7 Web Development Lab-II (PHP/JSP) (BTIT-407)

UNIT-I Introduction to PHP:

Identify Relationship Between Apache, Mysql and PHP, Steps to Install and Test Web Server, Configure Apache to Use PHP, Create Simple PHP Page Using PHP Structure and Syntax, Use of PHP Variables, Data Types and PHP Operators, Apply Control Structures in Programming, Steps to Create User Defined Functions.

UNIT-II Working with in Built Functions:

Apply Various Inbuiltvariable(Gettype, Settype, Isset, Strval, Floatval, Intval, Print_R), String(Chr, Ord, Strtolower, Strtoupeer, Strlen, Ltrim, Rtrim, Trim, Substr, Strem, Strcasecmp, Crops, Strops, Stristr, Str_Replace, Strrev, Echo, Print), Math(Abs, Ceil, Floor, Round, Fmod, Min, Max, Pow, Sqrt, Rand), Date (Date, Getdate, Setdate, Checkdate, Time,

Mktime), Array(Count, List, In_Array, Current, Next, Previous, End, Each, Sort, Array_Merge, Array_Reverse), File Functions(Fopen, Fread, Fwrite, Fclose)in Programming .

UNIT-III: Working With Data And Forms:

Steps to Create an Input Form (Text Fields, Text Areas, Check Boxes, Radio Buttons, List Boxes, Password Controls, Hidden Controls, Image Maps, File Uploads, Buttons), Steps to Use Using PHP\$_Get And \$_Post, \$_Request Method for a Given Application, Combining HTML and PHP Codes Together on Single Page, Redirecting the User.

UNIT-IV: Session, Cookies And Error Handling:

Use Cookie to Store and Retrieve Data, Use Querystring to Transfer Data, Create Session Variable and Handle Session, Starting and Destroying Session Working with Session Variables, Passing Session IDs, Handle Runtime Errors Through Exception Handling, Error Types in PHP. Database Connectivity Using MYSQL: Concepts and Installation Of Mysql, Mysql Structure and Syntax, Types of Mysql Tables and Storage Engines, Mysql Commands, Integration of PHP with Mysql, Connection to the Mysql Database, Creating And Deleting Mysql Database Using PHP, Updating, Inserting, Deleting Records in the Mysql Database, Hosting Website (Using “C” Panel, Using FileZilla Software)

UNIT-V: Java Server Pages Basics:

Integrating Scripts in JSP, JSP Objects and Components, Configuration and Troubleshooting, JSP: Request and Response Objects, Retrieving the Contents of An HTML Form, Retrieving a Query String, Working with Beans, Cookies, Creating and Reading Cookies. Using Application Objects and Event Handling.

Text Books:

1. W. Jason Gilmore, “Beginning PHP and MySQL”, 4th Edition, Apress, 2010
2. Steven Holzner, “PHP: The Complete Reference”, Tata McGraw-Hill, 2008
3. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5”, Third Edition, O’reillyMedia, 2014

Reference Books:

1. Julie C. Meloni, “Teach yourself PHP, MySQL and Apache All in one”, 5th Edition, Pearson Education, 2012
2. Phil Hanna, “JSP 2.0: The Complete Reference”, Tata McGrawHill, 2011.

List of Practical’s:

1. Write a PHP script to display Welcome message.
2. Write a PHP script to demonstrate arithmetic operators, comparison operator, and logical operator.
3. Write PHP Script to print Fibonacci series.
4. Write PHP script to demonstrate Variable function
5. Write PHP script to demonstrate string function.
6. Write PHP script to demonstrate Array functions.
7. Create student registration form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.
8. Write two different PHP script to demonstrate passing variables through a URL.
9. Write PHP script to demonstrate passing variables with cookies.
10. Write an example of Error-handling using exceptions.

- 11. Write a PHP script to connect MySQL server from your website.**
- 12. Write a program to read customer information like cust_no, cust_name, item_purchase, and mob_no, from customer table and display all these information in table format on output screen.**
- 13. Write a program to read employee information like emp_no, emp_name, designation and salary from EMP table and display all this information using table format.** **14. Create a dynamic web site using PHP and MySQL.**
- 15. Write a program for JSP scriptlet tag that prints the user name**
- 16. Write a program for JSP expression tag that prints current time**
- 17. Write a program for JSP declaration tag that declares method**
- 18. Write a program for JSP for request and response implicit object**
- 19. Write a program for JSP for session implicit object**
- 20. Write a program for JSP for exception implicit object**
- 21. Write a program for JSP for Simple example of java bean class**
- 22. Write a program for JSP for JSP Action Tags**

- Sem 4

S.1 Environment and Energy Studies (ML-301)

UNIT I Environmental Pollution and Control Technologies:

Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and industrial pollution, Ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid Waste management composition and characteristics of e - Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, Secondary and Tertiary.

UNIT II Natural Resources: Classification of Resources:

Living and Non - Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problem, Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable energy source, case studies.

UNIT III Ecosystems:

Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Energy flow in the ecosystem, Biogeochemical cycles, Bioaccumulation, ecosystem value, devices and carrying capacity, Field visits.

UNIT IV Biodiversity and its Conservation:

Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, manwildlife conflicts; Conservation of biodiversity: In-situ and Exsitu conservation. National biodiversity act.

UNIT V Environmental Policy, Legislation & EIA:

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP).

Text Books:

1. Agarwal, K.C.,(latest edition).Environmental Biology, Bikaner :Nidi Pub. Ltd.
2. Brunner R.C.(latest edition) Hazardous Waste Incineration, McGraw Hill Inc.
3. Clank R.S. .,(latest edition. Marine Pollution, Clanderson Press Oxford (TB).
4. De A.K(latest edition) Environmental Chemistry, Wiley Western Ltd.
5. ErachBharucha(2005).Environmental Studies for Undergraduate Courses by for University Grants Commission.

Reference Books:

1. R. Rajagopalan(2006).Environmental Studies. Oxford University Press.
2. M. AnjiReddy(2006).Textbook of Environmental Sciences and Technology. BS Publication.
3. Richard T. Wright(2008).Enviromental Science: towards a sustainable future PHL Learning Private Ltd. New Delhi.
4. Gilbert M. Masters and Wendell P. Ela.(2008).Environmental Engineering and science. PHI Learning Pvt Ltd.
5. Daniel B. Botkin& Edwards A. Keller(2008).Environmental Science Wiley INDIA edition.
6. AnubhaKaushik(2009).EnviromentalStudies. New age international publishers.

S.2 Computer Networks(BTIT-502)

UNIT I Computer Network:

Definitions, Goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, TCP/IP model overview, Descriptions of various layers and its comparison with TCP/IP. Network standardization.

UNIT II Data Link Layer:

Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB.

UNIT III MAC Sublayer:

Overview of MAC Layer, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11 wireless Communication.

UNIT IV Network Layer:

Need, Services Provided, Design issues, Routing and congestion in network layer, wired & wireless routing protocol examples, Routing algorithms: Least Cost Routing algorithm,

Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multi cast Routing. IP protocol, IP Addresses, subnetting, Comparative study of IPv4 & IPv6, Mobile IP.

UNIT V Transport Layer:

Overview, Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Session layer: Overview, Authentication, Session layer protocol. Presentation layer: Overview, Data conversion, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler). Application Layer: Overview, WWW and HTTP, FTP, SSH.

Text Books:

1. Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.
2. Behrouz A. Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
3. William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
4. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
5. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

Reference Books:

1. Kaveh Pahlavan, Prashant Krishnamurthy, Networking Fundamentals, Wiley Publication, 2009.
2. Michael A. Gallo & William M. Hancock, Computer Communications & Networking Technologies, Cengagepearson publications, 2001.
3. Dimitri Bertsekas, Robert Gallager, Data Networks, PHI Publication, Second Edition, 1992.
4. Ulysses Black, Computer Networks, PHI Publication, Second Edition, 1993.

List of Practical:

1. Demonstrate Different Types of Network Equipment's.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.
4. Experiment with basic network command and Network configuration commands.
5. Examine network IP.
6. Write a program to implement various types of error correcting techniques.
7. Write a program to implement various types of farming methods.
8. Implement & simulate various types of routing algorithm.
9. Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
10. Simulate STOP AND WAIT Protocols on NS-2.
11. Simulate various Routing Protocol on NS-2.
12. Simulate various Network Topologies on NS-2.
13. Configuring routers, bridges and switches and gateway on NS-2.

S.3 Operating Systems (BTCS-502)

UNIT I Introduction to Operating System:

Introduction and Need of operating system, Layered Architecture/Logical Structure of Operating system, Type of OS(Multiprogramming , Time Sharing, Real Time ,Networked, Distributed, Clustered, Hand Held), Operating system as Resource Manager and Virtual Machine, OS Services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader. Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

UNIT II Process Management:

Process Model, Creation, Termination, States & Transitions, Hierarchy, Context Switching, Process Implementation, Process Control Block, Basic System calls- Linux & Windows. Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling

UNIT III Interprocess Communication:

Introduction to Message Passing, Race Condition, Critical Section Problem, Peterson's Solution, Semaphore, Classical Problems of Synchronization Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Sleeping Barber Problem etc. Deadlock- System model, Resource types, Deadlock Problem, Deadlock Characterization, Methods for Deadlock Handling, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock Detection, Recovery from Deadlock.

UNIT IV Memory Management:

concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit and quick fit. Free space management- bitmap, link list/free list. Virtual Memory- concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging ,working set model, page fault frequency, thrashing, page replacement algorithms- optimal, FIFO, LRU; Belady's anomaly; TLB (translation look aside buffer).

UNIT V File Management:

Concepts, Naming, Attributes, Operations, Types, Structure, File Organization & Access (Sequential, Direct ,Index Sequential) Methods, Memory Mapped Files, Directory Structures One Level, Two Level, Hierarchical/Tree, Acyclic Graph, General Graph, File System Mounting, File Sharing, Path Name, Directory Operations, Overview Of File System in Linux & Windows. Input/output Subsystems- Concepts, Functions/Goals, Input/Output devices- Block And Character, Spooling, Disk Structure & Operation, Disk Attachment, Disk Storage Capacity, Disk Scheduling Algorithm- FCFS, SSTF, Scan Scheduling, C-Scan Schedule.

Text books:

1. Abraham Silberschatz,"Operating system concepts",10th Edition,John Wiley & Sons. INC, 2018
2. Andrew S.Tannanbaum, "Modern operating system", 4th Edition,Pearson Education, 2014
3. Dhananjay M. Dhamdhere, "Operating Systems:A concept Based Approach", 3rd Edition TMH, 2017,

4. SibsankarHaldar, Alex AlagarsamyAravind,"Operating System", 8 th Edition, Pearson Education India,, 2010

Reference Books:

1. Achyut S Godbole,"Operating System",3rd TMH,2017.
2. William Stalling, "operating system" 8th, Pearson Education, ,2014.
3. Vijay Shukla, "Operating System", 3rd, Kataria&Sons ,2013.
4. Singhal&Shivratri,"Advanced Concept in Operating Systems", 1st , TataMc-Graw Hill Education, edition 2017.

List of Practical:

- 1. Implement and update the BIOS settings of your PC.**
- 2. If there are 5 printers are connected in a system each process to print will take different time to complete, and CPU will give a fixed time to each process after that deadline next process will enter in CPU. If a problem not completed in a given slot then that process will be reenter as per the FCFS, on rotation basis? Apply the scheduling on this?**
- 3. Implement Non Preemptive Priority CPU Scheduling.**
- 4. Implement Non Preemptive Shortest Job first CPU Scheduling.**
- 5. If there are 5 different resources like 3 printer,2 scanner are connected to a system each taking different time to complete the task. Which scheduling is best and gives best performance of CPU?**
- 6. Implement the scheduling for that where CPU give chance to complete those process first which comes first?**
- 7. Implement Round-Robin CPU scheduling.**
- 8. Write a program to implement Semaphore.**
- 9. Find the solution for the situation where 5 faculties are sitting in a round table. There are 4 ball pens are placed on this table. At a time only one pen can be picked by one faculty to writing work. What will happen if all picked the pen for writing simultaneously?**
- 10. Find the solution for dentist checkup clinic where only one chair and one dentist is available for treatment. And having n chairs to waiting for patient.**
 - If there is no patient, then the doctor sleeps in his own chair.
 - When a patient arrives, he has to wake up the doctor.
 - If there are many patients and the doctor is doing treatment of him, then the remaining patients either wait if there are empty chairs in the waiting room or they leave if no chairs are empty.
- 11. Write a program for Memory Management Algorithms e.g. First Fit, Best Fit, Worst Fit.**
- 12. Demonstrate Virtual memory Techniques like, LRU, FIFO etc.**
- 13. Implement Shortest Seek Time First Disk Scheduling Algorithm.**
- 14. Implement Scan Scheduling Disk Scheduling Algorithm.**
- 15. Implement Circular Scan Disk Scheduling Algorithm.**
- 16. Implement Look Disk Scheduling Algorithm.**

S.4 Database Management Systems (BTCSI-405)

UNIT I

Introduction:

Concept & Overview of DBMS, Purpose of Database Systems, Architecture of DBMS, Data Models and its type, Schema and Instances, Data Independence, DBA and its function.

Entity-Relationship Model:

Entities, Attributes and its types, Mapping Cardinalities, Keys, Entity Relationship Diagram, Weak entity set and Strong entity set and Extended E-R features (Generalization , Specialization, Aggregation) ,ER Diagram to Relational Table conversion.

UNIT-II

Relational Model:

Structure of Relational Databases, Relation , Characteristics of Relations, Domains, Tuples , Relational schema and instance, Relational Algebra, Relational Algebra Operations (select, project, join and its type, union, intersection, set difference, Cartesian product, rename, division), Extended Relational Algebra Operations (Generalized Projection , Aggregate Functions , Outer Join),

Relational Calculus:

types of relational calculus, tuple and domain oriented relational calculus, and its operation.

UNIT-III

Integrity Constraints:

Null Values, Domain Constraints, Entity Integrity Constraints Referential Integrity Constraints, Key constraints, Triggers.

Relational Database Design:

Functional Dependency, Inference rule, Different Anomalies in designing a Database. Normalization , Decomposition, Normal Forms (1NF, 2NF, 3NF, BoyceCodd Normal Form, Normalization using Multi-Valued Dependencies, 4NF, Join Dependency, 5NF), Canonical cover.

UNIT IV

Query Optimization:

Introduction, steps of optimization, various algorithms to implement select, project and join operations of relational algebra, optimization methods: heuristic based, cost estimation based.

Transaction Processing, Concurrency Control and Recovery Management:

Transaction Model properties, State Serializability, Lock base protocols, Two Phase Locking, Time Stamping Protocols for Concurrency Control, and Validation Based Protocol, Multiple Granularities, Granularity of Data Item. Multi version schemes, Recovery with Concurrent Transaction, Recovery technique based on Deferred Update and Immediate Update, Shadow Paging, Recovery in Multi Database System and Database Backup and Recovery from Catastrophic Failure.

UNIT V

Index structures:

Types of index (primary, secondary, clustering, partitioning, unique and non index), use and Purpose of index, searching via an index.

SQL: DDL, DML, DQL (column function and grouping, union, multiple queries, union all, sub-query using IN, NOT IN, HAVING, GROUP BY CLAUSE), DCL (grant, revoke), TCL (Commit, roll back, save point, set Transaction)

Distributed database:

Planning for distributed database, management-centralized and decentralized Back-up and recovery.

Text books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.GrawHill, 6th Edition,2015.
2. C J Date, “An Introduction to Database System”, Pearson Educations, 8th Edition, 2004.
3. Elmasri, Navathe, “Fundamentals of Database Systems”, Pearson Educations 7th Edition, 2016.
4. SeemaKedar, Database Management System, Technical Publications, 2009. 5.
- 5.Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.

Reference Books:

1. IBM Career Education- database management system.
2. Abraham Silberschatz and S Sudarshan “Database System Concepts” 6th Edition McGraw-Hill Education – Europe 2013.
3. Raghu Ramakrishnan and Johannes Gehrke “Database Management Systems” McGrawHill Education, 2003.
4. Kahate, Atul “Introduction to Database Management Systems”Pearson Education India, 2006.

List of Practical:

1. Design a Database and create required tables. For e.g. Bank, College Database.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for table and record handling like implementing INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements and DROP, ALTER statements.
4. Write the queries for Retrieving Data from a Database Using the WHERE clause , Using Logical Operators in the WHERE clause , Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions and Combining Tables Using JOINS.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT () .
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Display name, hire date of all employees using cursors.
10. Display details of first 5 highly paid employees using cursors.
11. Write a database trigger which fires if you try to insert, update, or delete after 7'o' clock.
12. Write a data base trigger, which acts just like primary key and does not allow duplicate values.
13. Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.
14. Write the query for creating the users and their role. Using GRANT and REVOKE operations

J2EE Event Handling & GUI Design Event handling, AWT: Windows, Graphics, Text, AWT Controls, Layout Managers, and Menus, Images, GUI Programming with Swing, Exploring Swing, Swing Menu

UNIT-II

Java Servlet Overview, Servlet Interface, Request, Servlet context, response, Session, Dispatching request, Web Application

UNIT-III

JDBC Standard Extension 2.0 Introduction to databases (SQL ,No - SQL) Connecting to Databases – JDBC principles – Databases access – Interacting – Database search – Database support in Web applications MySQL , Model View Controller, JSP , HTML , CSS.

UNIT-IV

ORM and J2EE Frameworks: Introduction to Frameworks:- Struts, Spring basics, Spring AOP , Introduction to JavaScript and JQuery

UNIT-V

Advance J2EE Topic: JavaMail 1.2(Sending and Receiving Mail, Mail body design, different components), Java Messaging Service (JMS) 1.0.2 (Architecture, Programming Model, Connection, Session, Producer, Consumer), Java API for XML Parsing (JAXP) 1.1 (Introduction, Parsing and XML, when to use SAX)

TEXT BOOKS:

1. Arnold, Ken, James Gosling, and David Holmes. **The Java programming language**. Addison Wesley Professional, 2005.
2. Keogh, James. "The Complete Reference J2ME." published by McGrawHill OSBORNE Edition (2003)..
3. Allamaraju, Subrahmanyam, et al. "Professional Java Server Programming J2EE 1." (2001).
4. Deshmukh, Hanumant, and JigneshMalavia. SCWCD exam study kit: Java web component developer certification. Manning Publications Co., 2002.
5. Cay, Horstmann, and Cornell Gary. "Core Java 2, Volume II–Advanced Features." (2005).

REFERENCES:

1. Kito D. Mann, "Java Server Faces in Action",2nd Edition, Dreamtech Press , 4 January 2005
2. Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley, "JDBC™ API Tutorial and Reference" Third Edition, Addison Wesley, 11 June 2009).
3. GiulioZambon , "Beginning JSP, JSF and Tomcat", 2nd Edition , Apress ,29 September 2012.
4. AnghelLeonard , "JSF2.0 CookBook" ,3rd Edition , PACKT publication ,2010.
5. Bryan Basham, Kathy Sierra & Bert Bates, "Head First Servlets and JSP" , 3rd Edition , O'Reilly Media,2012.

LIST OF EXPERIMENTS:

1. How to set up multiple panels, compound borders, combo boxes.
2. Write a Program to implement Event handling.
3. Write a Program to develop Java Servlet and use request and response
4. Write a Program which allows the user to enter data in a jsp form and display in webpage

5. Show basic JDBC operation

6. Create Servlet file which contains following function:

- 1) Connect
- 2) Create Database
- 3) Create table
- 4) Insert records into respective table
- 5) Update records of particular table of database
- 6) Delete records from table
- 7) Delete table and also Database.

7. Write a program to demonstrate Spring.

8. Write a program to demonstrate Spring JDBC operation.

9. Write a program to demonstrate Java Mail functionalities.

10. Write a program to demonstrate JMS queues.

S.6 Unix and Shell Programming Lab (BTIT-406)

UNIT-I Introduction to UNIX –

The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal and External Commands, Command Structure. General purpose utilities: cal, date, echo, printf, bc, script, passwd, path, who, uname, tty, stty, pwd, cd, mkdir, rmdir, od.

UNIT-II Handling Files and C Environment –

The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount, chmod, The vi editor ,security by file Permissions. Networking commands: ping, telnet, ftp, finger, arp, rlogin. The C compiler, vi editor, compiler options, and run the programs.

UNIT-III: Shell Basics –

Types of shells, Shell Functionality, Work Environment, Writing script & executing basic script, Debugging script, Making interactive scripts, Variables (default variables), Mathematical expressions. Conditional statements: If-else-elif, Test command, Logical operators - AND, OR, NOT, Case –esac. Loops: While, For, Until, Break & continue.

UNIT-IV: Command Line Arguments & Regular Expression –

Command line arguments, Positional parameters, Set & shift, IFS. Functions & file manipulations: Processing file line by line, Functions. Regular Expression & Filters: Regular expression, Grep, cut, sort commands, Grep patterns.

UNIT-V: SED and AWK –

SED, Scripts, Operation, Addresses, commands, Applications, grep and sed. AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

Text Books:

1. Stephen Prata “Advanced UNIX: A Programming's Guide”, BPB Publications, 2017.

2. Maurice J. Bach “Design of UNIX O.S. ”, PHI Learning, 2015.

3. Brian W. Kernighan & Rob Pike, "The UNIX Programming Environment", PHI Learning, 2015.
4. Sumitabha Das: "YOUR UNIX – The Ultimate Guide", Tata McGraw Hill, 23rdreprint, 2012.
5. Yashavant Kanetkar, "Unix Shell programming", 1st Edition, BPB Publisher, 2010.

Reference Books:

1. Behrouz A. Forouzan, Richard F. Gilbery, "Unix and Shell Programming", 1st Edition, Cengage Learning India, 2003.
2. Graham Glass, King Ables, "Unix for programmers and users", 3rd Edition, Pearson Education, 2009.
3. Sumitabha Das, "Unix Concepts and Applications", 4th Edition. TMH, 2006.
4. N.B. Venkateswarlu, "Advanced Unix programming", 2nd Edition, B S Publications, 2010.

List of Practical:

1. Perform installation of UNIX/LINUX operating system.
2. Study of UNIX general purpose utility commands.
3. Execution of various file/directory handling commands.
4. Working with the vi editor: Creating and editing a text file with the vi text editor using the standard vi editor commands.
5. Write a shell script for calculator (to perform basic arithmetic and logical calculations).
6. Write a shell script sum.sh that takes an unspecified number of command line arguments (up to 9) of ints and finds their sum. Modify the code to add a number to the sum only if the number is greater than 10.
7. Write a shell script that will take an input file and remove identical lines (or duplicate lines from the file).
8. Write a shell script takes the name a path (eg: /afs/andrew/course/15/123/handin), and counts all the sub directories (recursively).
9. Shell scripts to explore system variables such as PATH, HOME etc.
10. Write a shell script that takes a name of a folder as a command line argument, and produce a file that contains the names of all sub folders with size 0 (that is empty sub folders)
11. Execution of various system administrative commands.
12. Write awk script that uses all of its features.
13. Write a shell script to display list of users currently logged in.
14. Write a shell script to delete all the temporary files.
15. Write a shell script to search an element from an array using binary searching.
16. Write shell script to perform different string operations of arrays.

S.7 Mobile App Development Lab (BTIT-306)

UNIT-I

Introduction to mobile Devices and Administrative,Mobile Devices vs. Desktop devices - ARM and Intel Architectures - Power Management - Screen Resolution - Touch interfaces - Application development - App Store, Google Play, Windows Store - Development Environments Introduction: XCode , Eclipse , PhoneGAP, etc - Native vs. web applications.

UNIT-II

Mobile OS Architectures:Comparing and Contrasting architectures of all three – Android, iOS and Windows - Underlying OS (Darwin vs. Linux vs. Win 8) - Kernel structure and native level programming - Runtime (Objective-C vs. Dalvik vs. WinRT) - Approaches to Power Management – Security.

UNIT-III

Introduction to Android Development Environment, Android/iOS/Win 8 Survival and basic apps, Mobile frameworks, Tools, Native Level Programming on Android Low-level programming on (jailbroken) iOS or Windows low level APIs. Study Different Open Source Frameworks, Tools And Basic Languages Used For Mobile Development

UNIT-IV

Intents and Service: Android ,Intents and Services , Characteristics of Mobile Applications, Successful Mobile Development, Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Android Storing and Retrieving Data ,Working with a Content Provider, Communications Via Network and the Web, State Machine, Correct Communications Model

UNIT-V

Android Networking and Web , Telephony, Wireless Connectivity and Mobile Apps, Notifications and Alarms, Memory Management, Graphics Performance and Multithreading, Graphics and UI Performance Android Graphics and MultimediaMobile Agents , Location Mobility and Location Based Packaging and DeployingPerformance Best Practices.

TEXT BOOKS:

1. John Horton, “Android Programming for Beginners: Build in-depth, full-featured Android apps starting from zero programming experience” 2nd Edition, Packt Publishing, October 31, 2018
2. Mike van Drongelen, Aravind Krishnaswamy, “Lean Mobile App Development” ,2nd edition, Packt Publishing, 28 Nov 2017
3. Chris Griffith , “Mobile App Development with Ionic”, Revised Edition, O'Reilly Media, August 2017
4. Rick Boyer , Kyle Mew, “Android Application Development Cookbook” 2nd Revised Edition, Packt Publishing, March 31, 2016
5. Christian Keur “iOS Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides) ” 6 edition Big Nerd Ranch Guides Publishing 27 Dec. 2016

REFERENCES:

1. <http://www.tutorialspoint.com/android/>
2. <https://www.lynda.com/Mobile-Apps-training-tutorials>
3. https://www.tutorialspoint.com/ios/ios_objective_c.htm
4. <https://developer.android.com/training/basics/>

LIST OF EXPERIMENTS:

1. Study of difference open source mobile development tools.
2. Installation of eclipse and Android Studio.

3. Develop an application that uses GUI components, Font and Colors.
4. Develop an application that uses Layout Managers and event listeners.
5. Develop a native calculator application.
6. Develop an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of database.
8. Develop an application that makes use of RSS Feed.
9. Implement an application that implements Multi threading.
10. Develop a native application that uses GPS location information.
11. Implement an application that writes data to the SD card.
12. Implement an application that creates an alert upon receiving a message.
13. Develop a mobile application that creates alarm clock.

- Sem 5

S.1 Computer Graphics and Multimedia (BTCS-503)

UNIT I Introduction to Computer Graphics:-

What is Computer Graphics?, Where Computer Generated pictures are used, Elements of Pictures created in Computer Graphics Graphics display devices, Graphics input primitives and Devices. **Introduction to openGL**:- Getting started Making pictures, Drawing basic primitives Simple interaction with mouse and keyboard

UNIT II Points and Lines, AntialiasingLine Drawing Algorithm:-

DDA line drawing algorithm, parallel drawing algorithm **Bresenham's drawing algorithm** with example. **Circle and Ellipse generating algorithms**:- **Mid-point Circle algorithm** with example **Mid-point Ellipse algorithm** **Mid-point Ellipse algorithm** with example **Parametric Cubic Curves**:- **Bezier curves** **B-Spline curves** **Filled Area Primitives**:- **Scan line polygon fill algorithm**, **Pattern fill algorithm** **Inside-Outside Tests**, **Boundary fill algorithms**, **Flood fill algorithms**

UNIT III

2D Geometric Transformations -

Basic transformation, **Matrix representation** and **Homogeneous Coordinates** **Composite transformation** **Other transformations**. Transformation between coordinated systems. **Window to Viewport coordinate transformation**,

Clipping operations –

Point clipping, **Line clipping**:- **Cohen – Sutherland line clipping** **Liang – Barsky line clipping** **Midpoint subdivision**

Polygon Clipping-Sutherland –

Hodgeman polygon clipping **Weiler – Atherton polygon clipping** **3D object representation methods** **B-REP** , **sweep representations** , **CSG**

Basic transformations-

Translation, Rotation, Scaling

Other transformations-

Reflection, **Rotation about an arbitrary axis** **Composite transformations** **Projections – Parallel and Perspective** **3D clipping**

UNIT IV

3D Geometric Transformations and 3D Viewing Classification of Visible Surface Detection algorithm:-

Translation,Rotation, Scaling

Other transformations:-

Reflection,Rotation about an arbitrary axis Composite transformations Projections, Back Surface detection method Depth Buffer method Scan line method BSP tree method, Area Subdivision method.

UNIT V Multimedia System:

An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards.i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP, MOV, MPEG , compression standards, compression through spatial and temporal redundancy. Multimedia Authoring .

TEXT BOOKS:

1. Sinha and Udai , "Computer Graphics", Tata McGraw Hill
2. Parekh "Principles of Multimedia" Tata McGraw Hill
3. Prabhat k Andleigh, KiranThakral , "Multimedia System Design " PHI Pub.
4. Donald Hearn and M.P. Becker "Computer Graphics" Pearson Pub.

REFERENCES:

1. Computer Graphics, C Version, 2e Paperback – 2002
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. David F Rogers, "Procedural elements for Computer Graphics", Tata McGraw Hill, Second Edition.
5. Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice in C", Second edition, Pearson Education.
6. David Hillmaa, "Multimedia Technology & Applications, Delmar, 1998.

LIST OF EXPERIMENTS:

1. Implement DDA Line Drawing algorithm
2. Implement Bresenham's line drawing algorithm.
3. Implement Mid-Point circle drawing algorithm.
4. Implement Mid-Point ellipse drawing algorithm.
5. Implement cubic Bezier curve.
6. Implement a menu-driven program for 2D transformations.
7. Implement Line clipping algorithm using Cohen-Sutherland.
8. Implement Polygon Clipping using Sutherland Hodgeman.
9. Implement Scan line fill algorithm.
10. Study of Multimedia and Program for Flash.

S.2 Software Engineering and Project Management (BTCS-504)

UNIT-I Nature of Software:

Software Engineering, Software Process, A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models- Waterfall Model, Incremental Models, Evolutionary Models, Concurrent Models, Specialized Process Model, Unified Process, Personal and Team process Models, Process technology, Agile development.

UNIT-II Functional and Non-functional Requirements:

Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented Software Development, Use case Modeling, System and Software Requirement Specifications, Requirement Validation, Traceability.

UNIT-III The Software Design Process:

Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, SA/SD Component Based Design, Design Metrics.

UNIT-IV Software Testing Strategies-

Approach: Issues, Validation Testing and Their Criteria, System Testing, Alpha-Beta Testing, Debugging, Testing Conventional Applications, Testing Object Oriented Applications ,Testing Web Applications.

UNIT-V Need and Types of Maintenance:

Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance(SQA). Project Metrics.

Text Books:

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Tata McGraw-Hill, Seventh edition, 2009.
2. Richard Fairley, “Software Engineering Concepts” –, Tata Mcgraw Hill, 2008.
3. Pankaj Jalote ,”An Integrated Approach to Software Engineering”, Narosa Pub, 2005.
4. Richard H.Thayer,”Software Enginerring & Project Managements”,Willey India

Reference:

1. Bernd Bruegge, Allen H. Dutoit,“ Object-Oriented Software Engineering” Using UML, Patterns, and Java, PEARSON Third Edition, 2017.
2. Waman S.Jawadekar,”Software Enginerring”, TMH
3. Ian Sommerville, “Software Engineering”, Seventh Edition, Pearson Education Asia, 2007.
4. Rajib Mall, “Fundamentals of Software Engineering” Second Edition, PHI Learning.

List of Practical: Select a topic of the project, and then make the report on following points

1. System Analysis
1.1. Identification of Need

- 1.2. Preliminary Investigation**
- 2. Feasibility Study**
 - 2.1. Technical Feasibility**
 - 2.2. Economical Feasibility**
 - 2.3. Operational Feasibility**
- 3. Literature Survey**
 - 3.1. Work done by other**
 - 3.2. Benefits**
 - 3.3. Proposed Solution**
 - 3.4. Technology used**
- 4. Software Engineering Approach**
 - 4.1. Software Engineering paradigm Applied**
 - 4.1.1. Description**
 - 4.1.2. Advantage & Disadvantages**
 - 4.1.3. Reasons for use**
 - 4.2 Requirement Analysis**
 - 4.2.1 Software Requirement Specification**
 - 4.2.1.1 Glossary**
 - 4.2.1.2 Supplementary Specifications**
 - 4.2.1.3 Use Case Model**
 - 4.2.1.4 Comparative analysis documents**
 - 4.2.2 Conceptual Level Activity Diagram**
 - 4.3 Planning Managerial Issues**
 - 4.3.1 Planning Scope**
 - 4.3.2 Project Resources**
 - 4.3.3 Team Organization**
 - 4.3.4 Project Scheduling**
 - 4.3.5 Estimation**
 - 4.3.6 Risk Analysis**
 - 4.3.7 Security Plan**
 - 4.4 Design**
 - 4.4.1. Design Concept**
 - 4.4.2. Design Technique**
 - 4.4.3. Modeling**
 - 4.4.3.1. ER Model**
 - 4.4.3.2. DFD Model**
 - 4.4.3.2.1. DFD Model Level-0 and 1**
 - 4.4.3.2.2. DFD Model Level 2 and 3**
 - 4.4.3.3. Data Dictionary**
 - 4.4.3.4. Activity Diagram**
 - 4.4.3.5. Software Architecture**
 - 4.5 Implementation Phase**
 - 4.5.1. Language Used Characteristics**
 - 4.5.2. Coding**
 - 4.6 Testing**
 - 4.6.1. Testing Objectives**
 - 4.6.2. Testing Methods & Strategies used along with test data and the error listed for each test case for each function provided by the system.**

UNIT-I Introduction:

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT-II Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search. **UNIT-III**

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networksrepresentation, construction and inference, temporal model, hidden Markov model.

UNIT-IV Markov Decision process:

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT-V Reinforcement Learning:

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd Edition, Prentice Hall.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill.
3. Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House, Delhi.
4. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011.
5. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010.

WEBSITES FOR REFERENCE:

1. <https://nptel.ac.in/courses/106105077>
2. <https://nptel.ac.in/courses/106106126>
3. <https://aima.cs.berkeley.edu>
4. [https://ai.berkeley.edu/project_overview.html \(for Practicals\)](https://ai.berkeley.edu/project_overview.html)

LIST OF PRACTICALS:

1. Write a programme to conduct uninformed and informed search.
2. Write a programme to conduct game search.
3. Write a programme to construct a Bayesian network from given data.
4. Write a programme to infer from the Bayesian network.
5. Write a programme to run value and policy iteration in a grid world.
6. Write a programme to do reinforcement learning in a grid world.
7. Mini Project work.

UNIT-I

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security mechanism, Fundamental Security Design Principles, Attack Surface and Attack trees, A Model for Network Security. Introduction to Cyber crime, Cyber crime and Information Security, Classification of Cyber crimes, Cyber crime: The Legal Perspective, Cyber crime: An Indian Perspective.

UNIT-II

Introduction to Cyber offence, How Criminal plan the attack, Social Engineering, Cyber stalking, Cyber café and cyber crime, Botnets: The fuel of cybercrime, Attack vector, cloud computing. Cyber crime: Mobile and Wireless devices, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Setting for Mobile Devices, Authentication Service Security, Attack on Mobile Phones.

UNIT-III

Tools and Methods Used in Cyber crime, Proxy Server and Anonymizers, Phishing and Identity Theft, Password Cracking, Keylogger and Spyware, Virus and Worms, Trojan Horse and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attack on Wireless Networks.

UNIT-IV

Cyber crime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Information Technology Act, Digital Signature and the IT Act, Cybercrime and Punishment. Introduction to Cyber Forensics, Historical Background of Cyber Forensics, Cyber Forensics and Digital Evidence, Forensic Analysis of E-Mail, Digital Forensic Life Cycle, Approaching Computer Forensic Investigation, Relevance of OSI Model to Computer Forensic, Challenges in Computer Forensic.

UNIT-V

Network Access Control and Cloud Security, Transport- Level Security, Wireless Network Security, Electronic Mail Security, IP Security.

TEXT BOOKS:

1. William Stallings, “Cryptography and Network Security: Principles and Practice”, 7th Edition Pearson, 2017
2. Sunit Belapure, Nina Godbole “Cyber Security”, 1st edition, Wiley Publication, 2011

REFERENCES:

1. Carl Endorf, Eugene Schultz, Jim Mellander “Intrusion Detection & Prevention”, 1st Edition, TMH, 2007
2. Neal, Krawetz, Introduction to Network Security, 1st Edition, Cengage Learning, 2006
3. Atul Kahate, “Cryptography and Network Security”, McGraw Hill, 2009
4. Charlie Kaufman, Radia Perlman, Mike Speciner, Michael Speciner, “Network Security - Private communication in a public world”, 2nd Edition, TMH, 2002
5. Fourozon, “Cryptography & Network Security” 4th Edition, TMH, 2005
6. Mayank Bhushan “Fundamentals of Cyber Security”, 1st Edition, BPB Publication, 2017

7. Gaurav Gupta,Sarika Gupta “Information Security and Cyber Laws”,1st Edition, Khanna Book Publishing, 2011.

LIST OF PRACTICALS: At least ten practical based on the syllabus.

S.5 WIRELESS COMMUNICATION NETWORKS (BTIT-511)

UNIT-I Introduction to Wireless Communication System:

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Second generation Cellular Networks, Third Generation (3G) Wireless Networks ,Wireless Local Loop(WLL),Wireless Local Area network(WLAN),

UNIT-II The Cellular Concept- System Design Fundamentals:

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Cochannel and adjacent interference, Hand off Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization, Repeaters, Micro cell zone concept, Channel antenna system design considerations.

UNIT-III Mobile Radio Propagation Model, Small Scale Fading and diversity:

Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering, Link budget design, Max. Distance Coverage formula, Empirical formula for path loss, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread, Feher's delay spread, Types of small scale Fading, Rayleigh and rician distribution.

UNIT-IV Multiple Access Techniques:

Introduction, Comparisons of multiple Access Strategies TDMA, CDMA, FDMA, OFDM, CSMA Protocols. Mobile Network And Transport Layers :Mobile IP , Dynamic Host Configuration Protocol, Mobile Ad Hoc Routing Protocols, Multicast routing,TCP over Wireless Networks , Indirect TCP , Snooping TCP, Mobile TCP .Wireless Systems: GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, CDMA forward channels, CDMA reverse channels, Soft hand off, CDMA features, Power control in CDMA, Performance of CDMA System, GPRS system architecture.

UNIT-V

Introduction to Wi-Fi, WiMAX, Zig-Bee Networks, Software Defined Radio, UWB Radio, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network. Application Layer :WAP Model, Mobile Location based services ,WAP Gateway ,WAP protocols wireless bearers for WAP , WML ,WMLScripts.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education,
2. William Stallings, “Wireless Communications and Networks”, Pearson Education.
3. William D Stanley : Network Analysis with Applications, Pearson Education.

4. Roy Choudhary D: Network and systems, New Age Publication.
5. Wireless Communication, Theodore S. Rappaport, Prentice hall

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", First Edition, Pearson Education, 2000 UNIT III.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2000 UNIT III.
3. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
4. Wireless digital communication, Kamil Feher, PH.

S.6 MANAGEMENT INFORMATION SYSTEM (BTIT-513)

UNIT-I Organizations and Computing:

Introduction, Modern Organization-IT enabled- Networked Dispersed- Knowledge Organization, Information Systems in Organizations- what are information systems?, Brief history of computing- ENIAC: Way to commercial computers- Advent of artificial intelligence- advent of personal computing-Free Software Movement- Advent of Internet, The role of internet- Internet and Web: they are different-the internet changes everything

UNIT-II Managing Information Systems in Organizations:

Introduction, Managing in the Internet Era, Managing Information Systems in Organization- the IT interaction model, Challenges for the manager what information to build?-how much to spend on information systems?-what level of capabilities should be created with information systems?-how centralized should the services be?-what security levels are required?-what is technology road map for the organization?

UNIT-III Data and Information:

Introduction, data and information- measuring data, information as a resource, information in organizational functions, types of information technology, types of information systemstransaction processing systems-management information system.

UNIT-IV Decision making and communication:

Introduction, Decision making with MIS-Tactical decisions operational decisions-strategic decisions, communication in organizations- types of communication examples of communications in organizations- decision making with communication technology

UNIT-V Strategy:

Introduction, Information goods-properties-technology lock-in and switching costs-network externalities-positive feedback-tippy markets, information systems and competitive strategy-value chain, the Role of CIO-information system's plan-vendor coordination-technology updates-return on investment on technology.

TEXT BOOKS:

1. Kenneth C. Laudon & Jane P. Laudon, **Essentials of Management Information Systems**, Tenth Edition, Pearson Prentice Hall, 2012
2. Terry Lucey, **Management Information Systems**, Ninth Edition, 2005, Thompson.

S.7 INFORMATION STORAGE AND MANAGEMENT (BTIT-611)

Unit-I: Introduction:

Digital data and its types, Information storage, Key characteristics of data center, Evolution of computing platforms. Introduction to storage technology: Data Proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

Unit-II: Storage System Architecture:

Intelligent disk subsystems overview, Contrast of integrants modular array, Component Architecture of Intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Unit-III: Introduction to network storage:

JBOD, DAS, NAS, SAN & CAS evolution and comparison, Applications, Elements, Connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN

Unit-IV: Hybrid storage solutions and virtualization:

memory, network, server, storage & appliances. Data centre concepts & requirements, Backup and disaster recovery. Industry Management standards, standard framework applications, Key management metrics.

Unit-V: Information storage on clouds:

concept of cloud, cloud computing, storage on cloud, Cloud benefits, Cloud computing evolution. Application & services on cloud, cloud service providers, cloud deployment models, Essential characteristics of cloud computing.

TEXT BOOK:

1. G.Somasundaram & Alok Shrivastava editors, **ISM: Storing, Managing, and Protecting Digital Information**; Wiley India

REFERENCES:

1. Saurabh; **Cloud Computing : Insight into New era Infrastructure**; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; **Storage Network explained: Basic and application of fiber channels, SAN, NAS, ISESI, INFINIBAND and FCOE**, Wiley India.
3. Sosinsky, **Cloud Computing Bible**, Wiley India.

S.8 ENTERPRISE RESOURCE PLANNING (BTIT-712)

Unit I: Introduction to ERP

1. Enterprise Resource Planning –Introduction

- 2. Need of ERP**
- 3. Advantages of ERP**
- 4. Growth of ERP**

Unit II: ERP and Related Technologies

- 1. Business process Reengineering (BPR)**
- 2. Management Information System (MIS)**
- 3. Decision Support Systems (DSS) Executive Support Systems (ESS)**
- 4. Data Warehousing**
- 5. Data Mining**
- 6. Online Analytical Processing (OLTP)**
- 7. Supply Chain Management (SCM)**
- 8. Customer Relationship Management (CRM)**

Unit III: Modules of ERP

- 1. ERP modules & Vendors** Finance Production planning, control & maintenance Sales & Distribution Human Resource Management (HRM)
- 2. Inventory Control System.**
- 3. Quality Management** ERP Market

Unit IV:

- 1. ERP Implementation**
- 2. ERP Implementation Life Cycles** Evaluation and selection of ERP package
- 3. Project planning Implementation**
- 4. Team training & testing**
- 5. End user training & Going Live**
- 6. Post Evaluation & Maintenance.**

Unit V: Post implementation of ERP

- 1. ERP Case Studies** Post implementation review of ERP Packages in Manufacturing Services

REFERENCES:

- 1. Leon, A. (2008). Enterprise Resource Planning.** New Delhi; Tata McGraw-Hil Education
- 2. Kumar, V., Venkitakrishna, N. K. (1998). ERP - Concepts and Practice.** New Delhi; PHI
- 3. Garg, Venkitakrishnan (2003).ERP Concepts and Planning.** New Delhi; PHI Learning.

S.9 Programming with Python (BTCS-407)

UNIT-I Introduction to Python:

The basic elements of Python, Branching programs, Strings and Input, Iteration, Functions, Scoping and Abstraction: Functions and Scoping, Specifications, Recursion, Global variables, Modules, Files.

UNIT-II Testing and Debugging:

Testing, Debugging. Structured Types, Mutability and Higher order Functions: Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries.

UNIT-III Exceptions and assertions:

Handling exceptions, Exceptions as a control flow mechanism, Assertions. Classes and Object oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and information hiding.

UNIT-IV Some simple Algorithms and Data Structures:

Search Algorithms, Sorting Algorithms, Hashtables. Plotting and more about Classes: Plotting using PyLab, Plotting mortgages and extended examples.

UNIT-V Dynamic Programming:

Fibonacci sequence revisited, Dynamic programming and the 0/1 Knapsack algorithm, Dynamic programming and divide and conquer.

TEXT BOOKS:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.
3. Mark Lutz "Learning Python" O'Reilly Media; 5 edition.
4. David Beazley "Python Cookbook, Third edition" O'Reilly Media

REFERENCES:

1. Python Essential Reference, 4th Edition Addison-Wesley Professional.
2. Mark Lutz "Programming Python: Powerful Object-Oriented Programming "David Beazley "Python Cookbook" Third edition, O'Reilly Media

LIST OF EXPERIMENTS:

1. Write a Python Program to Print Hello world!
2. Write a Program to Add Two Numbers.
3. Write a Program to Find the Square Root.
4. Write a Program to Calculate the Area of a Triangle.
5. Write a Program to Solve Quadratic Equation.
6. Write a Program to Swap Two Variables.
7. Write a Program to Generate a Random Number.
8. Write a Program to Convert Kilometers to Miles.
9. Write a Program to Convert Celsius To Fahrenheit.
10. Write a Program to check if a number is positive, negative or zero.
11. Write a Program to Check if a Number is Odd or Even.
12. Write a Program to Check Leap Year.
13. Write a Program to Find the Largest Among Three Numbers.
14. Write a Program to Check Prime Number.
15. Write a Program to Print all Prime Numbers in an Interval.
16. Write a Program to Find the Factorial of a Number.
17. Write a Program to Display the multiplication Table.

- 18. Write a Program to Print the Fibonacci sequence.**
- 19. Write an English sentence with understandable semantics but incorrect syntax. Write another English sentence which has correct syntax but has semantic errors.**
- 20. Create a program that prompts the user for a number of gallons of gasoline. Reprint that value along with its conversion equivalent number of liters.**
- 21. Write a program that allows a user to enter his or her two favorite foods. The program should then print out the name of a new food by joining the original food names together.**
- 22. Write a Tipper program where the user enters a restaurant bill total. The program should then display two amounts: a 15 percent tip and a 20 percent tip.**
- 23. Write a Car Salesman program where the user enters the base price of a car. The program should add on a bunch of extra fees such as tax, license, dealer prep, and destination charge. Make tax and license a percent of the base price. The other fees should be set values. Display the actual price of the car once all the extras are applied.**
- 24. Create a program with a function that calculates the area of a circle by taking a radius from the user.**
- 25. Write your own sum function called mySum that takes a list as a parameter and returns the accumulated sum.**

Scripting Languages (BTCS-607)

- Sem 6

S.1 Theory of Computation (BTCS-501)

UNIT-I Introduction:

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

UNIT-II Regular Expression (RE):

Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT-III Context Free Grammar (CFG) and Context Free Languages (CFL):

Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT-IV Push Down Automata (PDA):

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT-V Turing machines (TM):

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to undecidability, undecidable problems about TM, NP hard and NP complete problem, Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

TEXT BOOKS:

1. Hopcroft and Ullman, —Introduction to Automata Theory, Languages and Computation, Pearson Education, 3rd edition, 2014
2. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Pub. House, 2011.
3. K.L.P Mishra & N.Chandrasekaran,—Theory of Computer Science, PHI Learning, 3rd edition, 2006

REFERENCES:

1. Martin J. C., —Introduction to Languages and Theory of Computations, TMH, 4th edition, 2010.
2. Papadimitriou, C. and Lewis, C. L., —Elements of the Theory of Computation, PHI, 1997.
3. Michael Sipser,—Introduction to Theory of Computation, Cengage Learning, 3rd edition, 2013.

S.2 Internet of Things (BTCS-602)

UNIT-I Introduction to IoT:

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology FundamentalsDevices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT-II Elements of IoT:

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT-III IoT Application Development:

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration.

UNIT-IV Device data storage:

Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT–V IoT Case Studies:

IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

TEXT BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, **Internet of Things, “A Hands on Approach”**, University Press.
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, **“Introduction to Internet of Things: A practical Approach”**, ETI Labs.
3. Pethuru Raj and Anupama C. Raman, **“The Internet of Things: Enabling Technologies, Platforms, and Use Cases”**, CRC Press
4. Jeeva Jose, **“Internet of Things”**, Khanna Publishing House, Delhi.
5. Adrian McEwen, **“Designing the Internet of Things”**, Wiley.
6. Raj Kamal, **“Internet of Things: Architecture and Design”**, McGraw Hill.
7. Cuno Pfister, **“Getting Started with the Internet of Things”**, O Reilly Media.

LIST OF PRACTICALS:

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/‘0’ is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

Overview of Cloud Computing Introduction- Evolution, Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment, Advantages, Service & Deployment Models, Infrastructure, and Consumer View, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

UNIT-II :

Cloud Computing Technology Client systems, Networks, server systems and security from services perspectives, security and privacy issues; accessing the cloud with platforms and applications; Cloud storage

UNIT-III:

Working with Cloud Infrastructure as a Service – conceptual model and working, Platform as a Service – conceptual model and functionalities. Software as a Service –conceptual model and working. Trends in Service provisioning with clouds. Working on Microsoft Azure & IBM Smart Cloud.

UNIT-IV:

Using Cloud Services Cloud collaborative applications and services – case studies with calendars, schedulers and event management; cloud applications in project management. Amazon Web Services & applications, AWS EC2, S3, Cloud Analytics, Cloud Open Stack

UNIT-V:

Case studies- Microsoft Azure, Google App Engine, IBM Smart Cloud and Open source clouds,- Open-Nebula, Sales force and Eucalyptus, Cloud Simulation

TEXT BOOKS:

1. **Cloud Computing: A Practical Approach** by Anthony T. Velte Toby J. Velte, RobertElsenpeter, 2010 by The McGraw-Hill.
2. **Buyya, Selvi ,| Mastering Cloud Computing —,TMH Pub.**
3. **Michael Miller, Cloud computing – Web based Applications, Pearson Publishing, 2011**

REFERENCES:

1. **Kumar Saurabh, —Cloud Computing|, Wiley Pub,2012.**
2. **Krutz , Vines, —Cloud Security , Wiley Pub,2013.**
3. **Sosinsky, — Cloud Computing|, Wiley Pub,2012.**
4. **Murray Woodside; John Chinneck ; Marin Litiou on —Adaptive Cloud Deployment Using Persistence Strategies and Application Awareness|IEEEExplore, Year: 2017, Page(s):277 – 290.**

LIST OF EXPERIMENTS:

1. **Service deployment & Usage over cloud using Virtual Box.**
2. **Performance evaluation of services over cloud using VMware tool.**
3. **Working of Goggle Drive to make spreadsheet.**
4. **Working on Heroku for Cloud application deployment.**
5. **Working on Aneka sevices for Cloud application.**
6. **Working on services of Google App Engine.**
7. **Working on Application deployment & services of Microsoft Azure.**

8. Working on Application deployment & services of IBM Smart Cloud.
9. Working and configuration of Eucliptus.
10. Deployment & Services of Amazon Web Services.

S.4 Data Science (BTCS-608)

UNIT-I Introduction to Data Science:

Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

UNIT-II Introduction to Programming Tools for Data Science:

Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

UNIT-III Mathematical Foundations:

Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference

UNIT-IV Machine Learning: Overview of Machine learning concepts –

Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time SeriesLinear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning And Generalization, Overview of Deep Learning.

UNIT-V Case Studies of Data Science Application:

Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOKS & REFERENCES:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
5. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
6. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
<http://www.deeplearningbook.org>
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

LIST OF PRACTICALS:

1. Write a programme in Python to predict the class of the flower based on available attributes.
2. Write a programme in Python to predict if a loan will get approved or not.
3. Write a programme in Python to predict the traffic on a new mode of transport.
4. Write a programme in Python to predict the class of user.
5. Write a programme in Python to indentify the tweets which are hate tweets and which are not.
6. Write a programme in Python to predict the age of the actors.
7. Mini project to predict the time taken to solve a problem given the current status of the user.

S.5 Simulation and Modeling (BTCS-612)

UNIT-I INTRODUCTION

Introduction to simulation & modeling, advantages and disadvantages of simulation, application areas in communication, computer and software design, systems and systems environment, components of a system, discrete and continuous systems, model of a system, types of models, discrete-event simulation, steps in a simulation study. Simulation Examples- Simulation of queueing systems, on-demand and inventory systems, simulation for reliability analysis, Introduction to GPSS.

UNIT-II COMPUTER BASED SYSTEM SIMULATION:

Types of System Simulation, Monte Carlo Method, comparison of analytical and Simulation methods, Markov Model, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

UNIT III INTRODUCTION TO QUEUING THEORY

Characteristics of queuing system, Poisson's formula, birth-death system, equilibrium of queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system, FSM, Petri-net Model.

UNIT-IV VERIFICATION AND VALIDATION

Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions , Validating Input & Output Transformations, Design of simulation experiments,

UNIT-V SIMULATION TOOLS Simulation Tools –

Model Input – High level computer system simulation – CPU – Memory, Simulation – Comparison of systems via simulation – Simulation Programming techniques, Development of Simulation models, General Purpose Simulation Package-MATLAB, ARENA, EXTEND, Study of SIMULA, DYNAMO

TEXT BOOKS:

- 1 Gordon G., **System simulation**, PHI Learning
- 2.Singh V.P **System Simulation and Modeling** NEW AGE INTERNATIONAL, PUBLISHERS
- 3.Taha H, **Operations Research**; PHI.

- 4.Payer, T., **Introduction to system simulation**, McGraw Hill.
5.Spriet JA; **Computer Aided Modeling and Simulation**, Academic Press INC; USA

REFERENCES:

1. J K Sharma, **Operations Research Theory and Application**, Pearson Education Pvt Ltd, 2 Edition Banks J; **Hand book of Simulation**; John Wiley.
- 2.Law AM and Kelton WD; **Simulation Modeling and Analysis**; TMH

LIST OF EXPERIMENTS:

1. Simulate CPU scheduling algorithm using queueing system.
2. Simulate multiplexer using queuing system.
3. Simulate Network congestion control algorithms using Petri-net Model.
4. Simulate disk scheduling algorithms Petri-net Model.
5. Verification and validation of Petri-net Model.
6. Simulate a Manufacturing shop and write a program in GPSS.
7. Simulate Telephone system model and write a program in SIMSCRIPT.
8. Graphical Simulation and Modeling using MATLAB.
9. Study of SIMULA.
10. Study of DYNAMO.

S.6 Software Testing and Quality Assurance (BTCS-613)

UNIT-I BASIC CONCEPTS:

Basic Testing Vocabulary, Quality Assurance versus Quality Control, The Cost of Quality, Software Quality Factors, Software Defect, The Multiple Roles of the Software Tester(People Relationships), Scope of Testing, Testing Constraints, Various software development Life cycles (SDLC), Independent Testing, QA Process, Levels of Testing, The —VII Concept of Testing.

UNIT-II WHITE BOX TESTING:

White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis.

UNIT-III BLACK BOX TESTING:

Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning -Syntax testing - Finite state testing - Levels of testing – Unit testing- Integration Testing

UNIT-IV SYSTEM TESTING –

Functional testing-non-Functional testing-acceptancetestingperformance testing –Factors and Methodology for Performance testing, Regression testingMethodology for Regression-testing.Five Views of Software Quality, McCall’s Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, Quality Characteristics, Software Quality Standard

UNIT-V ADVANCE SOFTWARE TESTING METHOD (OBJECT ORIENTED TESTING):

Syntax testing - Finite State testing - Levels of testing - Unit, Integration and System Testing. Challenges - Differences from testing non-OO Software - Class testing strategies - State-based Testing Software quality Assurance: ISO 9000; CMM and Test Management Issues; Quality Assurance personnel Issues.

TEXT BOOKS:

1. KshirasagarNaik&PriyadarshiTripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,Software Enginerring, TMH
4. Sommerville,Software Enginerring,Pearson Education.
- 5.—IBM CE-Enablement Program- Essentials of Software Engineering (OOAD & SW Lifecycle), IBM Career Education

REFERENCES:

1. KshirasagarNaik&PriyadarshiTripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,Software Enginerring, TMH
4. Sommerville,Software Enginerring,Pearson Education.
5. <http://www.softwaretestinghelp.com/online-software-testing-course-syllabus/>
6. <https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/1217201473127725.pdf>
7. <http://www.tutorialspoint.com/uml/>

LIST OF EXPERIMENTS:

1. Design test cases using Boundary value analysis by taking quadratic equation problem.
2. Design test cases using Equivalence class partitioning taking triangle problem.
3. Design test cases using Decision table taking triangle problem.
4. Design independent paths by calculating cyclometer complexity using date problem.
5. Design independent paths by taking DD path using date problem.
6. Design the test cases for login page of AMIZONE.
7. Manual Testing for PAN card verification.
8. Generate test case for ATM machine.
9. Overview of Testing process using Rational Robot.
10. Write a script to record verification point using Rational Robot (For GUI testing of single click on window OS).
11. Write a script to record verification point for Clip Board and alphanumeric values using Rational Robot.

S.7 Block Chain (BTCS-618)

UNIT-I Introduction:

Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto

currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain. Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT-II Understanding Block chain with Crypto currency:

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT-III Understanding Block chain for Enterprises:

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT-IV Enterprise application of Block chain:

Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain.

UNIT-V Block chain application development:

Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

TEXT BOOKS:

1. Melanie Swan, —**Block Chain: Blueprint for a New Economy**®, O'Reilly, 2015
2. Josh Thompsons, —**Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming**®.
3. Daniel Drescher, —**Block Chain Basics**®, Apress; 1st edition, 2017.
4. Anshul Kaushik, —**Block Chain and Crypto Currencies**®, Khanna Publishing House, Delhi.
5. Imran Bashir, —**Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained**®, Packt Publishing.
6. Ritesh Modi, —**Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain**®, Packt Publishing.
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman. Ramakrishna, —**Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer**®, Import, 2018

LIST OF PRACTICALS:

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on Cloud to run.

<https://github.com/hyperledger/><https://docs.docker.com/getstarted/>https://console.ng.bluemix.net/docs/services/block_chain/index.html

https://console.ng.bluemix.net/docs/containers/container_index.html#container_index

2. Create and deploy a block chain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chaincode, and perform invoke and query on your block chain network <https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-using-fabric-sdkjava/>

3. Interact with a block chain network. Execute transactions and requests against a block chain network by creating an app to test the network and its rules.

<https://developer.ibm.com/patterns/interacting-with-a-block-chain-network/>

4. Deploy an asset-transfer app using block chain. Learn app development within a Hyperledger Fabric network.

<https://developer.ibm.com/patterns/deploy-an-asset-transfer-app-using-block-chain/>

5. Use block chain to track fitness club rewards Build a web app that uses Hyperledger Fabric to track and trace member rewards.

<https://developer.ibm.com/patterns/fitness-club-rewards-points-iot-and-retail-integration/>

6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Block chain Starter Plan. Use Hyperledger Fabric to invoke chaincode while storing results and data in the starter plan.

<https://developer.ibm.com/patterns/car-auction-network-hyperledger-fabric-node-sdk-starterplan/>

7. Develop an IoT asset tracking app using Block chain. Use an IoT asset tracking device to improve a supply chain by using Block chain, IoT devices, and Node-RED.

<https://developer.ibm.com/patterns/develop-an-iot-asset-tracking-app-using-block-chain/>

8. Secure art using block chain digital certificates. Node.js-based auction application can help democratize the art market <https://developer.ibm.com/patterns/securing-art-using-block-chain-digital-certificates/>

9. Mini projects such as :

(i) Block chain for telecom roaming, fraud, and overage management. See how communication service providers use block chain to enhance their value chains.

<https://developer.ibm.com/patterns/blockchain-for-telecom-roaming-fraud-andoveragemanagement/>

(ii) Use IoT dashboards to analyze data sent from a Block chain network. Build an IoT app and IoT dashboards with Watson IoT Platform and Node-RED to analyze IoT data sent from a Block chain network. <https://developer.ibm.com/patterns/iot-dashboards-analyze-data-block-chain-network/>

(iii) Create an Android app with Block chain integration. Build a Block chain enabled health and fitness app with Android and Kubernetes.

<https://developer.ibm.com/patterns/create-an-android-app-with-block-chain-integration/>

(iv) Create a global finance block chain application with IBM Block chain Platform Extension for VS Code. Develop a Node.js smart contract and web app for a Global Finance with block chain use case <https://developer.ibm.com/patterns/global-financing-use-case-for-block-chain/>

(v) Develop a voting application using Hyperledger and Ethereum. Build a decentralized app that combines Ethereum's Web3 and Solidity smart contracts with Hyperledger's hosting Fabric and Chaincode EVM <https://developer.ibm.com/patterns/voting-app-hyperledger-ethereum/>

(vi) Create a block chain app for loyalty points with Hyperledger Fabric Ethereum Virtual Machine. Deploy Fabric locally with EVM and create a proxy for interacting with a smart contract through a Node.js web app <https://developer.ibm.com/patterns/loyalty-points-fabric-evm/>

S.8 Robotics (BTCS-617)

UNIT-I Introduction to Robotics:

Types and components of a robot, Classification of robots, closedloop and open-loop control systems.Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT-II Robot Kinematics and Dynamics:

Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT-III Sensors and Vision System:

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity /Affine/Projective transformations. Vision applications in robotics.

UNIT-IV Robot Control:

Basics of control: Transfer functions, Control laws: P, PD, PID. Non-linear and advanced controls.

UNIT-V Robot Actuation Systems:

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

TEXT BOOKS:

1. Saha, S.K., —Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., —Robotics, Oxford, New Delhi, 2006.
3. Niku Saeed B., —Introduction to Robotics: Analysis, Systems, Applications, PHI, New Delhi.
4. Mittal R.K. and Nagrath I.J., —Robotics and Control, Tata McGraw Hill.
5. Mukherjee S., —Robotics and Automation, Khanna Publishing House, Delhi.
6. Craig, J.J., —Introduction to Robotics: Mechanics and Control, Pearson, New Delhi, 2009
7. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, —Robot Modelling and Control, John Wiley and Sons Inc, 2005
8. Steve Heath, —Embedded System Design, 2nd Edition, Newnes, Burlington, 2003.
9. Merzouki R., Samantaray A.K., Phatak P.M. and Bouamama B. Ould, —Intelligent Mechatronic System: Modeling, Control and Diagnosis, Springer.

LIST OF PRACTICALS:

1. Study components of a real robot and its DH parameters.

2. Forward kinematics and validate using a software (Robo Analyser or any other free software tool).
3. Inverse kinematics of the real robot and validation using any software.
4. Use of open source computer vision programming tool openCV.
5. Image Processing using openCV.
6. Image Processing for color/shape detection.
7. Positioning and orientation of robot arm.
8. Control experiment using available hardware or software.
9. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
10. Project work

S.9 IT WorkshopSciLab/MATLAB (BTIT-608)

UNIT-I INTRODUCTION TO SIMULATION SOFTWARE:

**About SCILAB/MATLAB, SCILAB/MATLAB System, Starting and Quitting
SCILAB/MATLAB. EXPRESSIONS: Variables Numbers, Operators Functions, Expressions.**

UNIT-II FLOW CONTROL:

If, else, and else if, switch and case, for, while, continue, break try - catch, return. **COMMAND WINDOW: The format Function, Suppressing Output, Entering Long Statements, Command Line Editing.**

UNIT-III MATRICES AND ARRAYS:

Entering Matrices sum and transpose, subscripts, colon Operator, magic Function. **WORKING WITH MATRICES: Generating Matrices, The load Function, M-Files, Concatenation, Deleting Rows and Columns, Linear Algebra, Arrays Multivariate Data, Scalar Expansion, Logical Subscripting, find Function.**

UNIT-IV SCRIPTS & FUNCTIONS:

Scripts, Functions, Global Variables, Passing String Arguments to Functions, eval Function, Function Handles, Vectorization , Pre allocation. **OTHER DATA STRUCTURE: Multidimensional Arrays, Cell Arrays, Characters and Text, Structures**

UNIT-V GRAPHICS:

Plotting Process, Editing Process, Preparing Graphs, Basic Plotting Functions, Mesh & Surface Plot, and Image Reading & Writing, Printing graphics. **SIMULINK**

TEXT BOOKS & REFERENCES:

1. MATLAB and its Applications in Engineering, Rajkumar Bansal, Pearson Publishers, ISBN-10: 8131716813, 2009.
2. A Guide to MATLAB: For Beginners & Experienced Users By: Kevin R. Coombes, John E. Osborn, Garrett J. Stuck
3. SCILAB(a Free Software to Matlab),Er. HemaRamachandran and Dr. Achutsankar Nair, S. Chand Publishers, ISBN-10: 8121939704,2011
4. Introduction to SCILAB by Rachna Verma and Arvind Verma
5. SCILAB—A Beginner's Approach by Anil Kumar Verma

6. <http://in.mathworks.com/>

7. <https://www.scilab.org/resources/documentation/tutorials>

LIST OF PRACTICALS:

1. Addition, subtraction and multiplication of two matrices.
2. Verify whether the given matrix is singular or non-singular and compute its inverse if applicable.
3. Sorting of 1-D array and searching of an array/matrix. Also, list the set of numbers that obey a common condition in an array/matrix using `find()`.
4. Solve simultaneous equations (maximum of three) using Cramer's rule. [Simultaneous equations may be obtained by applying KCL or KVL for a circuit and they can be solved for voltages or currents, respectively]
5. a) Show that $\log_{10}(A \cdot B) = \log_{10} A + \log_{10} B$ and $\log_{10}(A/B) = \log_{10} A - \log_{10} B$
b) Plot the voltage across capacitor during charging $V_c = V_0[1 - e^{-(t/RC)}]$
6. a) Plot a straight line for the given slope and intercept using different plot attributes.
b) Differentiate and integrate $y = mx + c$, separately, and display the results on the same plot.
7. Plot $y_1 = A \cdot \sin(2\pi f_1 t)$, $y_2 = B \cdot \cos(2\pi f_2 t)$ and $y_3 = A \cdot \sin(2\pi f_1 t) + B \cdot \cos(2\pi f_2 t)$, in time and frequency (after computing DFT or FFT) domains as subplots and infer the results.
8. Integrate and differentiate $\sin(x)$ and display the results on the same plot in different colors. Also display $\sin(x)$ on the same plot.
9. Compute mean, median, standard deviation and variance of a set of data using formulae and verify using built-in functions.
10. Find all the even and prime numbers between two numbers (range).
11. Demonstrate
 - (a) reading and display image,
 - (b) converting color image to gray and black-and-white and plotting their histograms, and
 - (c) conversion of image file formats.
12. Compare the results of the built-in and user-defined function to compute $\cos(x)$ [the series $\cos(x) = 1 - (x^2 / 2!) + (x^4 / 4!) - (x^6 / 6!) + \dots$ can be used]
13. Write a program to compute roots of a quadratic equation $ax^2 + bx + c = 0$ given a , b and c .

S.10 Minor Project (BTCS-606)

Objectives/Learning Outcomes/Capability Development

Program Learning Outcomes

This course contributes to the following program learning outcomes:

- **Enabling Knowledge:**

You will gain skills as you apply knowledge with creativity and initiative to new situations. In doing so, you will:

Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology

Recognize and use research principles and methods applicable to Information Technology.

- **Critical Analysis:**

You will learn to accurately and objectively examine, and critically investigate Information Technology (IT) concepts, evidence, theories or situations, in particular to:

analyze and model complex requirements and constraints for the purpose of designing and implementing software artifacts and IT systems

Evaluate and compare designs of software artifacts and IT systems on the basis of organizational and user requirements.

• Problem Solving: Your capability to analyze complex problems and provide suitable solutions will be extended as you learn to: design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification.

• Communication: You will learn to communicate effectively with a variety of audiences through a range of modes and media, in particular to: interpret abstract theoretical propositions, choose methodologies, justify conclusions and defend professional decisions to both IT and non-IT personnel via technical reports of professional standard and technical presentations.

• Responsibility: You will be required to accept responsibility for your own learning and make informed decisions about judging and adopting appropriate behaviour in professional and social situations. This includes accepting the responsibility for independent life-long learning and a high level of accountability. Specifically, you will learn to: effectively apply relevant standards, ethical considerations, and an understanding of legal and privacy issues to designing software applications and IT systems.

• Research and Scholarship: You will have technical and communication skills to design, evaluate, implement, analyze and theorize about developments that contribute to professional practice or scholarship; specifically you will have cognitive skills:

To demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice or scholarship

To plan and execute a substantial research-based project, capstone experience and/or piece of scholarship.

Course Learning Outcomes Upon successful completion of this course you should be able to:

- Identify a task or problem relevant to /or IT
- Search and review of the relevant literature
- Propose a solution to the task or problem
- Develop a software and/or algorithmic solution to the task or problem
- Implement solutions to meet high quality requirements developed by the supervisor
- Carry out research under supervision
- Present the research in a written form like that used for published papers
- Present the research in an oral seminar.

Overview of Learning Activities

A Minor project is a substantial work of supervised research or software development. You will choose an academic staff member as your supervisor to work on a research project. To successfully complete the course, you must demonstrate research skills: ability to undertake research under supervision, ability to analyze, develop, and present the research in a written form like that used for published papers, and ability to present the research in an oral seminar. In this course, you are expected to carry out research activities including implementing a complete solution to the problems identified by the supervisor, critical analysis of results, and completing a written Project. The major deadline for this course is the delivery of the Minor Project by the end of the semester.

Overview of Assessment

You must satisfactorily complete each of the following assessment tasks for this course:

Research project comprising an implemented and critically analyzed solution to the task or problem

Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area

Seminar on your research (of 20 minutes) soon after your Project is submitted.

The Minor Project is assessed on its merits as a research publication. Each Project is examined by two academics, usually from within the Institute.

- Sem 7

S.1 Human Values and Professional Ethics (BBAI-501)

Unit I: Human Value

1. Definition, Essence, Features and Sources
2. Sources and Classification
3. Hierarchy of Values
4. Values Across Culture

Unit II: Morality

1. Definition, Moral Behaviour and Systems
2. Characteristics of Moral Standards
3. Values Vs Ethics Vs Morality
4. Impression Formation and Management

Unit III: Leadership in Indian Ethical Perspective.

1. Leadership, Characteristics
2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)
3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).

Unit IV: Human Behavior – Indian Thoughts

1. Business Ethics its meaning and definition
2. Types, Objectives, Sources, Relevance in Business organisations.
3. Theories of Ethics, Codes of Ethics

Unit V: Globalization and Ethics

1. Sources of Indian Ethos & its impact on human behavior

2. Corporate Citizenship and Social Responsibility – Concept (in Business),
3. Work Ethics and factors affecting work Ethics.

Suggested Readings

1. Beteille, Andre (1991). Society and Politics in India. AthlonePress:New Jersey.
 2. Chakraborty, S. K. (1999). Values and Ethics for Organizations. oxford university press
 3. Fernando, A.C. (2009). Business Ethics - An Indian Perspective .India: Pearson Education: India
 4. Fleddermann, Charles D. (2012). Engineering Ethics. New Jersey: Pearson Education / Prentice Hall.
 5. Boatright, John R (2012). Ethics and the Conduct of Business.Pearson. Education: New Delhi.
 6. Crane, Andrew and Matten, Dirk (2015). Business Ethics. Oxford University Press Inc:New York.
 7. Murthy, C.S.V. (2016). Business Ethics – Text and Cases. Himalaya Publishing House Pvt. Ltd:Mumbai
 8. Naag Rajan, R.R (2016). Professional Ethics and Human Values. New Age International Publications:New Delhi.
- S.2 Compiler Design (BTCS-601)

Unit – I: Introduction:

Compiler, Compilers analysis of the source program, Phases of a compiler, Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens. Unit – II: Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

Unit – III: Intermediate Code Generation:

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

Unit – IV: Code Optimization and Run Time Environments:

Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

Unit – V: Code Generation:

Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

Text Books:

1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

References:

1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

List of Experiments:

1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.
7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.

S.3 OBJECT ORIENTED ANALYSIS AND DESIGN (BTIT-604)

UNIT-I Introduction:

About Object Orientated Technology, Development and OO Modeling History. Modeling Concepts: Modeling design Technique, Three models, Class Model, State model and Interaction model.

UNIT-II Class Modeling:

Object and class concepts, link and association, Generalization and Inheritance, Advanced class modeling- aggregation, Abstract class meta data, constraints. State Modeling: Event, state, Transition and conditions, state diagram, state diagram behavior, concurrency, Relation of Class and State models. Interaction Modeling: Use case Models, sequence models, activity models

UNIT-III Analysis and Design:

Development Life cycle, Development stages, Domain Analysis-Domain class model, domain state model, domain interaction model, Iterating and analysis. Application Interaction model, Application class model, Application state Model, Adding operation.

UNIT-IV System Design:

Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage, Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

UNIT-V Class design:

Overview of class design, designing algorithms recursing downward, refactoring, design optimization, Adjustment of Inheritance, Rectification of Behavior.

TEXT BOOKS:

S.1 Michael Blaha and J. Rumbugh, “Object oriented Modeling and design with UML”, Pearson Education

REFERENCES:

- 1. Satzinger, Jackson and Burd, “Object oriented Analysis and design with the Unified Process”, CENGAGE Learning.**
- 2. O’Docherty, “Object Oriented Analysis and Design Understanding, System Development with UML2.0”, Wiley India.**

LIST OF EXPERIMENTS

- 1. How to write a Problem Statement**
- 2. Perform the system analysis: Requirement analysis, SRS.**
- 3. Perform the function oriented diagram: DFD and Structured chart.**
- 4. Perform the user’s view analysis: Use case diagram.**
- 5. Draw the structural view diagram: Class diagram, object diagram.**
- 6. Draw the behavioral view diagram: Sequence diagram, Collaboration diagram.**
- 7. Draw the behavioral view diagram: State-chart diagram, Activity diagram.**
- 8. Draw the implementation view diagram: Component diagram.**
- 9. Draw the environmental view diagram: Deployment diagram.**

S.4 BIG DATA AND HADOOP (BTCS-702)

UNIT I

Introduction about big data ,Describe details Big data: definition and taxonomy , explain Big data value for the enterprise , Setting up the demo environment ,Describe Hadoop Architecture , Hadoop Distributed File System, MapReduce& HDFS , First steps with the Hadoop , Deep to understand the fundamental of MapReduce

UNIT II –

Hadoop ecosystem, Installing Hadoop Eco System and Integrate With Hive Installation, PigInstallation, Hadoop , Zookeeper Installation , Hbase Installation , Sqoop Installation, Installing Mahout Introduction to Hadoop , Hadoop components: MapReduce/Pig/Hive/HBase, Loading data into Hadoop, Getting data from Hadoop.

UNIT III

Using Hadoop to store data, Learn NoSQL Data Management, Querying big data with Hive, Introduction to the SQL Language , From SQL to HiveQL , Querying big data with Hive, Introduction to HIVE e HIVEQL, Using Hive to query Hadoop files. Moving the Data from RDBMS to Hadoop, Moving the Data from RDBMS to Hbase , Moving the Data from RDBMS to Hive UNIT IV Machine Learning Libraries for big data analysis, Machine Learning Model Deployment, Machine learning tools , Spark & SparkML , H2O , Azure ML.

UNIT V

Monitoring The HadoopCluster , Monitoring Hadoop Cluster, Monitoring Hadoop Cluster with Nagios, Monitoring Hadoop Cluster, Real Time Example in Hadoop , Apache Log viewer Analysis , Market Basket AlgorithmsBig Data Analysis in Practice , Case Study , Preparation of Case Study Report and Presentation , Case Study Presentation

Text Books:

1. Tom White," Hadoop: The Definitive Guide Paperback – 2015" Shroff Publishers & Distributors Private Limited - Mumbai; Fourth edition (2015).
2. V. K. Jain (Author)," Big Data and Hadoop" Khanna Publishers; 1 edition (1 June 2015)
3. Jason Bell (Author) "Machine Learning for Big Data: Hands-On for Developers and Technical Professionals" Wiley (2014)
4. Big Data Analytics &Hadoop by IBM ICE Publications

References:

1. Big data. Architettura, tecnologie e metodi per l'utilizzo di grandi basi di dati, A. Rezzani, Apogeo Education, 2013
2. Hadoop For Dummies, Dirk deRoos, For Dummies, 2014
3. Cohen et al."MAD Skills: New Analysis Practices for Big Data", 2009
4. Ullman, Rajaraman, Mining of Massive Datasets, Chapter 2
5. Stonebraker et al., "MapReduce and Parallel DBMS's: Friends or Foes?", Communications of the ACM, January 2010.
6. Dean and Ghemawat, "MapReduce: A Flexible Data Processing Tool", Communications of the ACM, January 2010.

List of Practical's:

1. Installing Hadoop, configure HDFS, Install Zookeeper , Pig Installation, Sqoop Installation, Hbase Installation
2. Configuring Hadoop
3. Running jobs on Hadoop
4. Working on HDFS 5. Hadoop streaming

S.5 Next Generation Telecommunication Networks (BTCC-703)

UNIT-I

Basic history of Mobile Computing Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing.

UNIT-II

Next Generation Networks (NGN), Principles and definition of an NGN, The NGN architecture, Outline of technology choices, Network and implementation issues with NGN, Numbering & Addressing

UNIT-III

Wireless n/w. and Technologies Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G, Bluetooth, Radio frequency identification(Rfid), Wireless Broadband, Mobile IP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. ,IPv6

UNIT-IV

Next Generation Core NetworkThe role of the core network, Enabling Control and Reconfigurability, Packet Switching (ATM, IP, MPLS, Ethernet), IP Multi-Media System (IMS), Principles of control for IP networks, Concept of IMS UNIT-V NGN Service AspectsServices on an NGN, Service compatibility with PSTN and IN, Use of APIs and service provider interfaces, Brief review of the principles of mobile networks, Relationship of mobile developments to NGN

TEXT BOOKS

1. VALDAR, A R: 'Understanding Telecommunications Networks', IET Telecommunications Series 52, 2006
2. Convergence Technologies for 3G Networks: IP, UMTS, EGPRS and ATM Authors: Jeffrey Bannister, Paul Mather, and Sebastian Cope. . John Wiley & Sons, Ltd. ISBN 0-470-86091-X (HB)
3. Mobile Computing , Asoke K Telukder, Roopa R Yavagal, TMH
4. Wireless Communications and Networks, 3G and beyond, ITI SahaMisra, TMH

REFERENCES

1. M Carugi "Introduction to the ITU-T NGN focus group release 1: target environment, services, and capabilities," Communications Magazine, IEEE, vol.43, no.10, pp. 42- 48, Oct. 2005
2. Chae-Sub Lee, Knight, D. , "Realization of the next-generation network," Communications Magazine, IEEE, vol.43, no.10, pp. 34- 41, Oct. 2005.

S.6 Soft computing (BTCS-711)

UNIT-I

Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems, Soft Computing and its Techniques, Soft Computing verses Hard Computing. Applications of Soft Computing in the Current industry.

UNIT-II

Introduction to Fuzzy Logic, Crisp Sets, Fuzzy Sets, Fuzzy Relations, Membership Functions and features, Fuzzification, Methods of Membership Value Assignments, Defuzzification and methods, Lambda cuts. Fuzzy Measure, Fuzzy Reasoning, Fuzzy Inference System.

UNIT-III

Neural Network (NN), Biological foundation of Neural Network, Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network

UNIT-IV

Genetic Algorithm, Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

UNIT-V

Neuro-Fuzzy and Soft Computing, Adaptive Neuro-Fuzzy Inference System Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN. Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. Hybridization of other techniques.

TEXT BOOKS

1. S.N. Deepa and S.N. Sivanandam, Principles of Soft Computing, 2ed., Wiley, 2011
2. Vojislav Kecman, Learning and Soft Computing - Support Vector Machines, Neural Networks, and Fuzzy Logic Models, 1ed., The MIT Press, 2001.
3. D. K. Pratihar, Soft Computing, 1ed., Alpha Science, 2007.
4. Timothy J. Ross, Fuzzy logic with Engineering Applications, 3ed., John Wiley and Sons, 2010.
5. S. Rajasekaran and G.A.V. Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, 2ed. PHI
6. David E. Goldberg, Genetic Algorithms in search, Optimization & Machine Learning, 1ed., Addison-Wesley Publishing Company, 1989

REFERENCES

1. Jang, Sun and Mizutani, Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, 1ed., Pearson, 1997.
 2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, 1ed., Prentice Hall, 1995
 3. Simon Haykin, Neural Networks: A Comprehensive Foundation, 2ed. Prentice Hall, 1998
 4. Samir Roy and Udit Chakraborty, A Beginner's Approach to Soft Computing, 1ed., Pearson, 2013
- S.7 Quantum Computing (BTCS-715)

UNIT-I Introduction to Quantum Computing:

Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing, Overview of major concepts in Quantum Computing: Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement.

UNIT-II Math Foundation for Quantum Computing:

Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT–III Building Blocks for Quantum Program:

Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc, Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

UNIT–IV Quantum Algorithms:

Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks, Major Algorithms: Shor’s Algorithm, Grover’s Algorithm, Deutsch’s Algorithm, Deutsch -Jozsa Algorithm,

UNIT–V OSS Toolkits for implementing Quantum program:

IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)

TEXT BOOKS & REFERENCES:

1. Michael A. Nielsen, “Quantum Computation and Quantum Information”, Cambridge University Press.
2. David McMahon, “Quantum Computing Explained”, Wiley.
3. IBM Experience: <https://quantumexperience.ng.bluemix.net>
4. Microsoft Quantum Development Kit <https://www.microsoft.com/en-us/quantum/development-kit>
5. Forest SDK PyQuil: <https://pyquil.readthedocs.io/en/stable/>

S.8 Virtual Reality (BTCS-716)

UNIT–I Introduction to Virtual Reality:

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark. 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

UNIT–II Geometric Modelling:

Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation. Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection. Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

UNIT–III Virtual Environment:

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system. **Physical Simulation:** Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT-IV VR Hardware and Software: Human factors:

Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

UNIT-V VR Applications:

Introduction, Engineering, Entertainment, Science, Training. The Future: Virtual environment, modes of interaction

TEXT BOOKS & REFERENCES:

1. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
2. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
3. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006.
5. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application and Design", Morgan Kaufmann, 2008.
6. www.vresources.org
7. www.vrac.iastate.edu
8. www.w3.org/MarkUp/VRM

S.9 Project (BTCS-706)

S.No	Particular
1.	Group formation and Submission of Project Topic (At least three(03))
2.	Guide allotment and Topic Finalization
3.	Presentation –I Contents: 1. Problem Domain 2. Literature Survey 3. Feasibility Study 4. References
4.	Synopsis Submission
5.	Presentation – II Contents: 1. SRS / URD 2. Conceptual Design ,
6.	Presentation – III Contents: 1. Detail Design 2. Implementation & Test Plan
7.	Project Report Submission

2) B.tech (IBM - DS/FSDB/BDA/CMC/AI)

- Sem 1

S.1 Mathematics – (BTMACS-101)

UNIT I Differential Calculus:

Limits of functions, continuous functions, uniform continuity, monotone and inverse functions. Differentiable functions, Rolle's theorem, mean value theorems and Taylor's theorem, power series. Functions of several variables, partial derivatives, chain rule, Tangent planes and normals. Maxima, minima, saddle points, Lagrange multipliers, exact differentials

UNIT II Integral Calculus:

Riemann integration, fundamental theorem of integral calculus, improper integrals. Application to length, area, volume, surface area of revolution. Multiple integrals with application to volume, surface area, Change of variables.

UNIT III Numerical Analysis:

Number Representation and Errors: Numerical Errors; Floating Point Representation; Finite Single and Double Precision Differences; Machine Epsilon; Significant Digits. **Numerical Methods for Solving Nonlinear Equations:** Method of Bisection, Secant Method, False Position, Newton-Raphson's Method, Multidimensional Newton's Method, Fixed Point Method and their convergence.

UNIT IV Numerical Methods for Solving System of Linear Equations:

Norms; Condition Numbers, Forward Gaussian Elimination and Backward Substitution; Gauss-Jordan Elimination; FGE with Partial Pivoting and Row Scaling; LU Decomposition; Iterative Methods: Jacobi, Gauss Siedal; Power method and QR method for Eigen Value and Eigenvector.

UNIT V Vector Calculus:

Gradient and directional derivative. Divergence and Curl of Vector point function, line and surface integrals. Green's, Gauss' and Stokes' theorems and their applications.

Text Books:

6. T. M. Apostol, **Calculus, Volume I**, 2nd Ed, Wiley, 1967.
7. T. M. Apostol, **Calculus, Volume II**, 2nd Ed, Wiley, 1969.
8. K. E. Atkinson, **Numerical Analysis**, John Wiley, Low Price Edition(2004).
9. S. D. Conte and C. de Boor, **Elementary Numerical Analysis - An Algorithmic Approach**, McGraw-Hill, 2005.
10. B. S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers, Delhi

Reference Books:

7. R. G. Bartle and D. R. Sherbert, **Introduction to Real Analysis**, 5th Ed, Wiley, 1999.
8. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
9. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.

- 10. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill,2001.**
- 11. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi,2004.**
- 12. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill2008.**

S.2 APPLIED PHYSICS(BTPH-101)

UNIT I Quantum Physics:

Introduction to Quantum hypothesis, Matter wave concept, Wave Group and Particle velocity and their relations, Uncertainty principle with elementary proof and applications to microscope and single slit, Compton Effect, Wave function and its physical significance. Development of time dependent and time independent Schrodinger wave equation, Applications of time independent Schrodinger wave equation.

UNIT II Solid State Physics:

Free electron model, Qualitative Analysis of Kronig Penney Model, effective mass, Fermi level for Intrinsic and Extrinsic semiconductors, P-N junction diode, Zener diode, Tunnel diode, Photodiode, Solar- cells, Hall Effect, Introduction to Superconductivity, Meissner effect, Type I & II Superconductors.

UNIT III Nuclear Physics:

Nuclear Structure & Properties Nuclear models: Liquid drop with semiempirical mass formula & shell model. Particle accelerators: Cyclotron, Synchrotron, Betatron. Counters and Detectors: Giger-Muller counters, Bainbridge Mass Spectrograph and Auston Mass Spectrograph.

UNIT IV Laser & Fiber Optics:

Stimulated and Spontaneous Emission, Einstein's A&B Coefficients, Population Inversion, Pumping, Techniques of Pumping, Optical Resonator, Properties and Applications of Laser, Ruby, Nd:YAG, He-Ne lasers. Introduction to Optical fibre, Acceptance angle and cone, Numerical Aperture, V- Number, Ray theory of propagation through optical fibre, Pulse dispersion , applications of optical fibre.

UNIT V Wave Optics:

Introduction to Interference, Fresnel's Bi-prism, Interference in Thin films, Newton's rings experiment, Michelson 's interferometer and its application, Introduction to Diffraction and its Types, Diffraction at single slit, double slit, resolving power, Rayleigh criterion, Resolving power of grating, Concept of polarized light, Double refraction, quarter and half wave plate, circularly & elliptically polarized light.

Text Books:

1. Engineering Physics by Dr. S. L. Gupta and Sanjeev Gupta, Dhanpat Rai Publication, New Delhi.
2. Engineering Physics by Navneet Gupta, Dhanpat Rai Publication, New Delhi.
3. Engineering Physics by H. J. Sawant, Technical Publications, Pune, Maharashtra.
4. Engg Physics by M.N. Avdhanulu & P.G. Kshirsagar, S.Chand & Co. Edition (2010).
5. Fundamentals of Physics by Halliday, Wiley, India.

Reference Books:

1. Concepts of Modern Physics by Beiser, TMH, New Delhi.
2. Solid State Physics by Kittel, Wiley India.
3. Atomic and Nuclear physics by Brijlal and Subramanyam.
4. LASERSs and Electro Optics by Christopher C. Davis, Cambridge Univ. Press (1996).
5. Optoelectronics an Introduction by J. Wilson & J.F.B. Hawkes, " Prentice-Hall II Edition.
6. LASER theory and applications by A. K. Ghatak & Tyagarajan, TMH (1984). 7. Optics by Ghatak, TMH.

List of Practical:

1. Measurement of radius of curvature "R" of convex lens by Newton's ring experiment.
2. Measurement of Numerical aperture of fiber by LASER.
3. Determination of Energy band gap „Eg“ of Ge using Four Probe method.
4. Measurement of Frequency of A.C. mains by electrically maintained vibrating rod.
5. Measurement of Resolving Power of Telescope.
6. Measurement of "λ" of LASER light source using Diffraction Grating.
7. Determination of Planck's constant by using photocell.
8. Determination of Energy band gap (Eg) using PN Junction Diode.
9. To determine the mass of cane sugar dissolved in water using half shade polarimeter.
10. To study forward and reverse characteristics of Zener diode.

S.3 Introduction to Computer Science and Engineering(BTCS-102)

UNIT I Introduction to Computer Fundamentals:

Introduction: What is Computer, Objectives, Hardware and software, Block Diagram of The Computer, Functions of the different Units, CPU(Central Processing Unit), Input unit, Output unit, Memory, Storage Devices, Representation of data and information, Computer Languages, Machine language, Assembly language, High level language, Number System and Conversion, Classification of Computers, History and Generations of Computer, Types of Computers, Characteristics of Computers, Introduction to Free and Open Source Software, Definition of Computer Virus, Types of Viruses, Use of Antivirus software. Applications of Computers: Home, Education and Training, Entertainment, Science, Medicine, Engineering etc.

UNIT II The Operating System:

The Graphical User Interface (GUI), Definition of Operating System, Objective, Types and functions of Operating Systems, Windows Operating System, Installing MS Windows, Working with Windows Operating System, System Tools and Applications in windows, MS-DOS (Disk Operating System), Basic DOS commands, Switching Between DOS and

Windows, Comparison of DOS and Windows, System Tools and Applications in MS-DOS, Other Operating Systems Unix, Linux etc.

UNIT III Office Automation Tools-I:

Word Processing Basics, Elements of word Processing and Working, MS-Office (Word, Access, Outlook, Front page etc), Objectives, Starting MS-Word, MS-Word Screen and its Components, Working with MS-Word, Menu Bar, Creating Documents, Using Templates, Saving a documents, Working with documents, Setting up pages of a document, Printing Documents with different options, Using Tables and Columns, Object Linking and Embedding, Hyperlink, Envelopes & Label Creation, Grammar & Spell Check, Mail Merge, Macro Creation, Previewing and Printing Documents.

UNIT IV Office Automation Tools-II:

Spread Sheet: Introduction to MS-Excel, Starting MS-Excel, Basics of Workbook and Spreadsheet, MS-Excel Screen and Its Components, Features of Excel, Elementary Working with MS-Excel, Manipulation of cells, Formatting of Spreadsheet and Cells, Formulas and Functions, Spread sheets for Small accountings, Previewing and Printing a Worksheet.
Power-point: Introduction to MS-PowerPoint, Starting MS-PowerPoint, Basics of PowerPoint, MS PowerPoint Screen and Its Components, Features of PowerPoint, Elementary, Elementary Working with MS-PowerPoint, Preparation of Slides, Creation of Presentation, Providing aesthetics, Slide Manipulation and Slide Show, Presentation of the Slides.

UNIT V Computer Communication and Internet:

Computers and Communication: Introduction to Computer Networks, Internet and World Wide Web, Communication and Collaboration(Electronic Mail), Basic of electronic mail, Web Browsers and Servers, Introduction to HTML, Use of Computer in Commerce, Internet Applications, Electronic Data Interchange, Electronic Payment System, Internet Security, Privacy, Ethical Issues & Cyber Law.

Text Books:

1. E Balagurusamy , “Fundamentals of Computers ”,TMH 2009.
2. Silakari and Shukla, “Basic Computer Engineering ”, Wiley India 2011.
3. V. Rajaraman, Neeharika Adabala, “Fundamentals of Computers”, Sixth edition PHI 2015
4. Ajoy Kumar Ray and Tinku Acharya ,“ Basic Computer Engineering”, PHI 2011.
5. P K Sinha ,“Fundamentals of Computers ” ,Fourth , BPB Publications, 2004. Reference

Books:

1. J. P. Tremblay and R.B. Bunt, “An Introduction of Computer Science –An Algorithmic Approach”,TMH 2015.
2. Faith Wempen , "Computing Fundamentals: Introduction to Computers ", Wiley 2015.
3. Norton, Peter, “Introduction to Computers”, Fourth revised ,Mc-Graw-Hill 2000.
4. Reema Thareja , “Fundamental of Computers”, Oxford University Press, 2014.

List of Practical:

1. Study and Perform different MS –DOS Commands (Internal and External).
2. Create the "test" directory in the directory you are currently in using MS-DOS.
3. Study of Word – Templates, Styles.
4. Create a new user and give it Administrator privilege for Microsoft windows OS.
5. Create a MS-Word .doc file contain your complete CV.
6. Study and perform different Excel Commands/Functions.
7. Perform MS-Excel Accounting.
8. Create a MS-Excel .xls file contain mark sheet.
9. Display the student's result into a chart using MS-Excel.
10. Create a MS-Power Point Presentation .ppt file covers the topic “Computer's Evolution”.
11. Create a MS-Power Point Presentation .ppt file covers the topic “social responsibility”.
12. Create a MS-Access database .mdb file to store the results of students.
13. Study of various Network topologies.

S.4 Digital Logic and Circuit Design(BTEC-104)

UNIT I Number System & Codes:

Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1's Complement & 2 's Complement representation and their arithmetic operation, Floating point representation, binary codes, BCD,ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II Boolean algebra and Logic gates:

Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan's theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / Quine McCluskey method.

UNIT III Combinational logic:

Arithmetic circuits- Half adder, Full adder, Halfsubtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

UNIT IV Sequential logic:

Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V Semiconductor Memories and A/D and D/A converters:

Semiconductor Memory – RAM, ROM Organization, operation and their Types, PLD-PAL, PLA, PROM, FPGA, Analog to Digital (A/D)and Digital to Analog (D/A) converters and their types

Text Books:

1. M. Morris Mano,“Digital Logic and Computer Design”, Pearson Education, 2016.

2. S Salivahanan and S Arivazhagan: Digital Circuits and Design,4th Edition, Vikas Publishing House,2012.

Reference Books:

- A. Anand Kumar, “Fundamentals of Digital Circuits”, 4th Edition, PHI, 2016.**
- 1. Floyd and Jain,“Digital Fundamentals”, 10th Edition, Pearson Education India, 2011.**
- 2. Roland J.Tocci,Widmer,Moss, “Digital Systems Principles and Applications”, 10th Edition, Pearson 2009.**
- 4. Stephen Brown, ZvankoVranesic, “Fundamentals of Digital Logic Design”, 3rd Edition, McGraw Hill, 2017.**

List of Practical:

- 1. To study and test of operation of all logic gates for various IC's (IC7400,IC7403,IC408,IC74332,IC7486).**
- 2. Verification of DeMorgan's theorem.**
- 3. To construct of half adder and full adder.**
- 4. To construct of half subtractor and full subtractor circuits.**
- 5. Verification of versatility of NAND gate.**
- 6. Verification of versatility of NOR gate.**
- 7. Design a BCD to excess 3code converter.**
- 8. Design a Multiplexer/ Demultiplexer**
- 9. Analysis of various flip flops with Preset and Clear capability.**
- 10. Design of Johnson and Ring counter.**
- 11.Design of synchronous and asynchronous up/down counters.**

S.5 Principles of 'C' language (BTCS-104)

UNIT I Introduction to Programming Languages:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals Of Algorithms, Flowcharts.

UNIT II Introduction to 'C' Language:

Character Set.Variables and Identifiers, Built-In Data Types. Variable Definition, Arithmetic Operators and Expressions, Constants And Literals, Simple Assignment Statement, Basic Input/Output Statement, Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement, Structured Programming.

UNIT III One Dimensional Arrays:

Array Manipulation; Searching, Insertion, Deletion of an Element from an Array; Finding the Largest/Smallest Element in an Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of a Square Matrix, Strings as Array of Characters, Address Operators,

Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions And Pointers, Arrays And Pointers, Pointer Arrays.

UNIT IV Top-Down Approach of Problem Solving:

Modular Programming and Functions, Standard Library of C Functions, Prototype of a Function: Formal Parameter List, Return Type, Function Call, Block Structure, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions and Arrays as Function Arguments Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

UNIT V Concept of Files:

File Opening in Various Modes and Closing of a File, Reading from a File, Writing onto a File.

Text Books:

1. Tennence W.Pratt, “Programming languages design and implementation”, Prentice Hall of India.
2. Allen B. Tucker, “Programming Languages”, Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH publications.
4. Balagurusamy, ”Programming with C++”, ANSI C TMH

Reference Books:

1. Roosta- Foundation of Programming Languages,Vikas
2. Jeyapoovan- A First Course in Prog with C, Vikas 8. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
3. Fundamentals of Programming Languages, R. Bangia,Cyber Tech .
4. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB

S.6 Software Foundation and Programming (1. Clean Coding; 2. Javascript; 3. NodeRed; 4. NodeJS) (BTIBM-105)

UNIT I

Introduction to Clean Coding

Understand the importance of bad and good code.

Understand the importance of meaningful distinct names.

Usage of domain and function names Usage of exceptions and its error code names/descriptions.

Understand about clean and bad comments.

Understand the process of vertical and horizontal formatting.

Introduction to Web-designing

Html basic commands, Webpage creation using tags like formatting tags, table, frame and form tags. CSS types and properties with examples.

UNIT II

Objects

- Learn about data abstraction.**
- Understand the data and object antisymmetric.**

Javascript Basics

- Nature of JavaScript language**
- Understand JavaScript primitive types.**

Javascript objects

- Understand Java Script Array Objects**
- Understand Java Script Date Objects**
- Understand Java Script Error Objects**

UNIT III

Javascript variables and Control statements

- Understand how to define JavaScript Variables.**
- Work Java Script If statements .**
- Work Java Script switch statements.**
- Work JavaScript for and while loop statements.**

Javascript Functions

- Declare a JavaScript function**
- Creating custom objects with functions**
- Adding functions to prototypes**
- Self-executing functions**

UNIT IV

Client side Javascript

- Understand Scripts in HTML documents**
- Describe the document object model (DOM) hierarchy**
- Overview of the DOM specification levels.**
- Describe the window and document objects.**
- Accessing document elements.**
- Common API in web and XML scripting Node.**

JS Introduction

- Understand NodeJS and its features.**
- Understand Express Framework.**
- Understand Key features of MongoDB**

UNIT V

Installation and Configuration

- Install NodeJS on command line.**
- Hands on: Create sample NodeJS + Express project using command line.**
- Install Node eclipse plugin**
- Hands-on: Create sample NodeJS + Express project using Eclipse**

File System

- Understand __dirname and filename**
- Understand synchronous vs Asynchronous file read.**

Understand View Templates.

How to serve static content in NodeJS

Connecting to the database using NodeJS

Install and Setup MongoDB

NodeJS Mongo Driver

Perform CRUD Operation

Understand Connection Pooling using NodeJS and Mongo Driver

Hands on Develop Web Application using Node JS and Mongo DB

Text Books:

1. **Mastering HTML, CSS & Javascript Web Publishing** by Lemay Laura, BPB Publications, ISBN: 9788183335157, 9788183335157
2. **Javascript** by Flanagan David, Packt publishers, ISBN: 9789350237311, 9789350237311
3. **Web technologies-black book** by Dreamtech Press publications, ISBN-13 : 978-9351199076, ISBN-10 : 935119907X

Reference Books:

1. **Java script by example** by Dani Akash Dani Akash S, Kindle Edition
2. **Java script: the good parts** by D Crockford, Kindle Edition
3. **IBM Study Materials**

List of Experiments:

- 1.Designing a table containing the properties like cellpadding, cellspacing, rowspan, colspan, border etc.
- 2.Differentiate between frame and div tag with examples.
- 3.Biodata form creation
4. Implementation of different types of css with properties.
5. Use of javascript with html and css.
6. Program to implement javascript conditional statements.
7. Program to implement javascript switch case.
- 8.Javascript all types of loop creation.
9. Javascript array creation.
- 10.Program to implement javascript functions.
11. Program to implement javascript events.
12. Program to implement javascript objects.
13. Basic node.js code creation.
14. Example of MongoDB with node.js.

S.7 Programming Skills with 'C' (BTCS-108)

Unit - 1 Introduction to Programming:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals of Algorithms, Flow Charts.

UNIT II Programming using C:

C data types, int, char, float etc, C Expressions, Arithmetic Operation, Relational and Logic Operations, C Assignment Statements, Extension of Assignment of The Operations, C Primitive Input Output Using getchar and putchar, Exposure to the scanf and printf functions, C Statements, conditional executing using if, else, Optionally Switch and Break Statements may be mentioned.

UNIT III Iterations and Subprograms:

Concept of loops, Example of Loops in C Using for, while and do-while, Optionally continue may be mentioned, One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations, Concept of Sub-programming, functions Example of functions, Argument passing mainly for the simple variables.

UNIT IV Pointers and Strings:

Pointers, Relationship Between Arrays and Pointers Argument passing using Pointers Array of Pointers, Passing arrays as Arguments, Strings and C String Library.Structure and Unions, Defining C structures, Passing Strings as Arguments Programming Examples.

Unit –V File handling:

Console Input Output Functions, Disk Input Output Functions, Data files, Command Line Arguments, Bitwise Operators, Enumerated Data Types, Type Casting, macros, The C Preprocessor, More About library Functions.

Reference Books:

1. E Balaguruswamy , Object Oriented Programming With C++ , 4th Edition , TMH, 2008
2. Brian W. Kernighan and Dennis M. Ritchie ,“The C Programming Language”, 2nd Edition, Prentice-Hall India, New Delhi, 2002
3. Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2000
4. H. Cooper and H. Mullish, Jaico Publishing House. “Spirit of C”, 4th Edition, Jaico Publishing House, 2006

List of Practical:

1. Write a program to produce ASCII equivalent of given number.
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user
I $(ax+b)/(ax-b)$
II $(x^5+10x^4+8x^3+4x+2)$
4. Write a program to find sum of a geometric series.
5. Write a program to cipher a string.
6. Write a program to check whether a given string follows English capitalization rules.
7. Write a program to find sum of the numerical series.
8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.
9. Write a recursive program for tower of Hanoi problem
10. The fibonacci sequence of numbers is 1,1,2,3,5,8..... Based on the recurrence relation

a. $F(n)=F(n-1)+F(n-2)$ for $n>2$

b. Write a recursive program to print the first m Fibonacci number

11. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices

- a) Addition of two matrices
- b) Subtraction of two matrices
- c) Finding upper and lower triangular matrices
- d) Trace of a matrix
- e) Transpose of a matrix
- f) Check of matrix symmetry
- g) Product of two matrices.

12. Write a program that takes two operands and one operator from the user perform the operation and then print the answer.

13. Write a program to print pyramid.

14. Write functions to add, subtract, multiply and divide two complex numbers $(x+iy)$ and $(a+ib)$. Also write the main program.

15. Write a program to copy one file to other, use command line arguments.

16. Write a program to mask some bit of a number (using bit operations).

17. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

S.8 Software Foundation and Programming 1 (with 'C') (BTCS-105)

UNIT I: BRIEF HISTORY OF COMPUTING:

Evaluation of Computing, The Amazing difference Engine, Method of Finite difference, Evaluation of Modern Computing, The Abstract Turing Machine, A Simple TM Example, Von Newman Architecture, FORTRAN Beginning of Hill, Internet, Where is our world Heading Today.

UNIT II: BRIEF HISTORY OF PROGRAMMING LANGUAGES:

Program, Translator, Assembler, Compiler, Interpreter, Introduction to C Language, Getting Started with C, Escape Sequence, Data types, Comments, Input & output in C, Unformat Console I/O Function, Constructor, Loops and Array, Operators, Loops, Decision, Nested Loops, Break Statement, Continue Statement, Accessing Element of Array, Sorted Array, Types of Array, Multidimensional Array. FUNCTIONS Function Definition, Function Prototype, Function Calling, Scope of Variable, Functions with Arguments, Nesting of Function for not allowed, Recursion, Passing Array to the function, Storage classes to C, Program with Static, Automatic and External Variable.

UNIT III: POINTERS and STRUCTURES AND UNIONS — USER DEFINED DATA TYPES:

Types of Pointer, Pointer Arithmetic, Pointer in function, Call by Value, Call by Reference, Pointer & amp, Passed 2D Array in Function, Command line Argument, Advantage, disadvantage. Structure & Union File Input & output, Predefined File Object/Streams, Fgetc & Fputc, Printf and Scanf, Common errors Encountered in file handling, Text file Vs. Binary File, Fread and Fwrite.

UNIT IV: SCIENCE OF PROGRAMMING:

The Art of Writing Software, Recursion, Algorithm, Popular Search Algorithm, Binary Search, Binary Search Complexity, Binary Tree- Interesting Scenario, Skip List, Skip List Insertion, Sorting Algorithm, Measure of Software Quality, Object Oriented Programming, Functional Programming SOFTWARE IN REAL WORLD - SNEAK A PEEK Simple Programming Problem, Data Compression, Secured Transaction, Certificate, Analytics, IBM WATSON, The Canvas, Application Lifecycle Management, Application Infrastructure, Data Management, Business Analytics, Business Process Management. SOCIAL COLLABORATION Software in Real World about Licensing, Open Standard, Open Source & IBM, What is an Open Standard, What is an Open Source, Open Source Technology, Open Proposition and Conclusion.

UNIT V INTRODUCTION TO LINUX & PHP:

What is Linux and Why is so popular, What can you do with Linux, What is the Linux Technology Center, Plans for the Future, Installing Linux, PHP What is PHP, Key driver of Lamp Stack, Getting Started with PHP, PHP Data Object, PHP Deployment platform, What is ZEND Core, Features and benefits, What is Ruby, What is Rails, DB2 Application development Partners.

S.9 Web Development Lab-I(HTML & XML) (BTIT-307)

UNIT I Introduction to HTML:

What is HTML, HTML Documents, SGML, Basic structure of an HTML document, creating an HTML document, Headers tags, Body tags, Paragraphs formatting, Text Elements, Tag Elements, Special Character elements, Image tags, HTML Table tags and lists: Numbered list, Non- Numbered lists, Definition lists, Anchor tag, Name tag, Hyperlinks – FTP/HTTP/HTTPS, Links with images and buttons, Links to send email messages, Text fonts and styles, background colors/images, Marquee Behavior, Forms related tags. (Action, method, name, inputetc.)

UNIT II HTML5:

Introduction of HTML5, Browser supports, Migration from HTML4 to HTML5, New Elements in HTML5, HTML5 different parts layout of a web page, HTML5 Graphics: Canvas, SVG, HTML Media Tags: Inserting audio files, Inserting video files, Screen control attributes, Media control attributes, HTML Object.

UNIT III CSS:

Introduction of CSS, CSS Syntax CSS Id & Class. CSS Styling: styling Backgrounds, styling Text, styling Fonts, styling Links, styling Lists, styling Tables. CSS Box Model: Border, Outline, Margin, Padding. CSS Advanced: Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image capacity, Image Sprites, Media Types, and Attribute Selectors.

UNIT IV XML:

Introduction of XML, Cross scripting of XML, XML as intermediate language, Difference between XML and HTML, XML DOM, Tree, Syntax, Elements, Attributes, Namespaces, XPath, XML DTD, Applications, XQuery, XML Schema, XML Parser, XHTML: Introduction of XHTML, XHTML rules over the HTML, conversation HTML to XHTML.

UNIT V Java Script:

Introduction to client side scripting, Server side scripting, Java Script Syntax, Variables and Functions, Operators: JavaScript Arithmetic Operators, JavaScript Assignment Operators, JavaScript Popup Boxes, JavaScript Window, Events and Objects, JavaScript Function Call, Validation in webpages, Introduction of AJAX

Text Books:

1. Jennifer Niederst Robbins. Learning Web Design, Fifth Edition, O'Reilly Media, Inc, May 2018.
2. Frain and Ben. Responsive Web Design with HTML5 and CSS3, Second Edition, 2015.
3. Nicholas c.Zakas. Java Script for Web Developers, Third edition, 2012.
4. George Q. Huang, K. L Mak. Internet Applications in Product Design and Manufacturing, ISBN: 3540434658, 2003 edition, springer, 2012.

Reference Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible", Fifth Edition, WileyIndia, 2010.
2. John Duckett,"Beginning HTML, XHTML, CSS, and JavaScript ",WileyIndia, 2010.
3. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design",3rd edition, Wiley India, 2011.
4. Achyut S. Godbole, Atul Kahate, Web Technologies, ISBN: 9781259062681,3rd edition, TMH, 2013.

List of Practical:

1. Design a Web Page, Insert an image on to the web page such that image is of height 300 and width 300 pixels. The image should have an ALT text in it.
2. Create a Web page that holds a bulleted list of the names of your friends. Make sure that the bullets are in plain circle.
3. Create a Frame which would hold both the web page that was created earlier. The frame should be split row-wise into equal halves.
4. Create a Web Page to display the marks you got in all subjects of last semester using table.
5. Create a Form having two boxes with labels as First Name and Last Name. The User should not be allowed to enter the names directly in the text boxes. The input has to be given in the prompt box and then entered values should be given in the textboxes.
6. Create a Web Page that has a button in the center of the page. Using mouse events change the Message in the statusbar.
7. Design a Web page that accepts Username and Password. Opens a new window when the password corresponds to a particular value is set by the developer
8. Design a Web page that consists of 2 text boxes. When the page is first loaded set the focus to the first textbox. The user should not be allowed to leave the box unless enters a value in it.

9. To convert the HTML code to XHTML code.
10. To study the XML tree.
11. To study of Dreamweaver Tool.
12. To study of a Flash Animation Tool.

- Sem 2

S.1 Mathematics-II (BTMACS-201)

UNIT I Calculus of Matrices:

Systems of linear equations and their solutions. Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices.

UNIT II Differential Equation:

Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

UNIT III Numerical Analysis Interpolation and Curve Fitting:

Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton-Gregory Polynomial Form; Lagrange Polynomial Interpolation; Approximation by Least Square Method. Numerical Differentiation and Integration: Discrete Approximation of Derivatives: Forward and Backward Difference Forms, Numerical Integration, Simple Newton-Cotes Rules: Trapezoidal and Simpson's (1/3) Rules; Weddle's Rule.

UNIT IV Numerical Solution of ODE:

Euler's Method for Numerical Solution of ODE; Modified Euler's Method; Runge-Kutta Method (RK2, RK4); Multistep Method: Predictor-Corrector method.

UNIT V Probability Theory and Random Process:

Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, Poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains.

Text Books:

1. G. Strang, **Linear Algebra And Its Applications**, 4th Edition, Brooks/Cole, 2006
2. S. L. Ross, **Differential Equations**, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, **An Introduction to Ordinary Differential Equations**, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, **Elementary Differential Equations and Boundary Value Problems**, 7th Edition, Wiley, 2001.
5. K. E. Atkinson, **Numerical Analysis**, John Wiley, Low Price Edition (2004).

- 6. S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 2005.**
- 7. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi**

Reference Books:

- 1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley, 2005.**
- 2. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.**
- 3. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.**
- 4. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.**
- 5. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, 2001.**
- 6. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.**
- 7. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill 2008.**

S.2 Computer Peripherals and Interfaces (BTCS-204)

UNIT I Memory:

Introduction to memory and its use, Memory chips and Modules: DIPP, SIPP, SIMM, DIMM, SO-DIMM, RIMM, Parity checking and ECC, ROM and its types, RAM and its types, Trouble shooting of Memory, Advanced Memory technologies: RDRAM, DDRAM, PRAM, VRAM.

UNIT II Motherboard:

Motherboard Controllers and System Resources, I/O System Bus: ISA, MCA, ELSA, VESA local bus, PCI, AGP, PCIX, Onboard I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS settings, Motherboard Form factor: AT and ATX Motherboard, LPX and NLX form factor.

UNIT III Power Supply:

Power Supply Functions and Operations, Power Supply Quality and Specifications, Power Supply and Form factors, Ventilation and Cooling: Fan, Processor cooling, Temperature limits, Power Problems and procedures, Power protection devices, Back-up power system.

UNIT IV Interfaces and I/O Ports:

Floppy Disk interface: Controller, Power cable, Control/Data cable, IDE interfaces: ATA standards, Master/Slave Configuration, Data transfer modes, SCSI interface: Bus, Standards, Hardware's, which is better SCSI or IDE, Serial ports, Parallel ports, USB, Troubleshooting.

UNIT V Device Drives and Peripherals:

Magnetic Storage: Reading/Writing, hard disk drives, Floppy disk drives, Optical Storage devices: CD-ROM drive, DVD-ROM drive, Keyboard: layouts, interfaces, Pointing devices, Mouse, Monitors, Printers, Troubleshooting of device drivers and peripherals.

Text Books:

1. Craig Zacker & John Rourtre, PC Hardware- The complete reference, First Edition, TMH, 2017
2. S.K. Chauhan, PC Upgrading, maintenance and troubleshooting guide, First Edition,
3. B. Govindarajalu, IBM PC and CLONES: Hardware, Troubleshooting and Maintenance McGraw Hill Education, 2nd Edition 2002
4. Mark Minasi, The Complete PC Upgrade and Maintenance Guide, Sixteenth edition Wiley, 2005
5. Mike Meyers, Introduction to PC Hardware and Troubleshooting, 1st edition, McGraw Hill Education, 2017

Reference Books:

1. Stephen Bigelow, Bigelow's Troubleshooting, Maintaining & Repairing PCs, 5 edition, McGraw Hill Education, 2017
2. Manahar Lotia, Pradeep Nair, Payal Lotia, Modern Computer Hardware Course, Second Revised Edition, BPB Publications, 2007
3. Vikas Gupta, Comdex Hardware and Networking Course Kit: Revised & Upgraded, Dreamtech Press, 2014
4. Dan Gookin, Troubleshooting and Maintaining Your PC All-in-One For Dummies, 3rd edition, John Wiley & Sons, 2017
5. Robert Bruce Thompson, Barbara Fritchman Thompson, Building the Perfect PC, 3 edition, O'Reilly, 2010

List of Practical:

1. To study and demonstrate the motherboard.
2. To study microprocessor and its types.
3. To study Back Power Supply: SMPS and UPS.
4. To study the Optical Drives: CD-ROM and DVD-ROM.
5. To study the working principle of keyboard and mouse.
6. To study different types ports and slots on board.
7. To study various types of Cables and their Connectors.
8. To study the working principle of monitor.
9. To study different types of printers.
10. To study the process of assembling a Motherboard.
11. To study working of Floppy Disk Drive.

S.3 Design Thinking (BTIBM-203)

UNIT-I INTRODUCTION TO BUSINESS PROCESS MANAGEMENT & AS-IS BUSINESS PROCESS

Define business process management (BPM), List and describe the phases in the BPM lifecycle procedure, Define process modeling., Describe how to use IBM Business Process Manager to accomplish process modeling goals, Explain how to create and modify process applications in the Process Center, Create a process application, Explain case management, Describe the purpose and function of Blue works Live, List and describe the core notation elements that are used in IBM Process Designer, Create a business process definition (BPD)

from the process and nested process tasks and responsible, Explain how to create and modify process models with the Designer view of the IBM Process Designer.

UNIT-II PLAYBACK 0:

MODELING PROCESS List and describe gateways as they are used in IBM Process Designer, List and describe intermediate event types that are used in IBM Process Designer, Model a business process escalation path with an attached timer intermediate event, Describe the Playback 0 validation goals and requirements, Validate that a process model meets Playback 0 goals and Requirements, Describe IBM Business Process Manager product components, Identify the integrations with other IBM products.

UNIT-III ENTERPRISE DESIGN THINKING – HISTORY, OVERVIEW

Understand what came before Design Thinking, Identify who did what to bring it about, Learn how it built upon previous approaches, Get an overview of the whole approach to design thinking, Understand the principles, loop, and keys, Determine what is most important.

UNIT-IV ENTERPRISE DESIGN THINKING –7 KEY HABITS, THE LOOP, USER RESEARCH

Learn 7 key habits of effective thinkers design, Avoid common anti-patterns, Optimize for success with these habits, Understand the importance of iteration, Learn how to observe, reflect, & make, Get ready to drill down & do tomorrow, Understand the importance of user research, Appreciate empathy through listening, Learn key methods of user research.

UNIT-V ENTERPRISE DESIGN THINKING – MAKE, USER FEEDBACK:

Understand how Make fits into the Loop ,Learn how to leverage Observe information, Learn Ideation, Storyboarding, & Prototyping, Understand user feedback and the Loop, Learn the different types of user feedback, Learn how to carry out getting feedback.

Text Books:

1. IBM COURSEWARE – SKILLS ACADEMY

Reference Books:

1. IBM COURSEWARE – SKILLS ACADEMY

List of Practical:

- 1. CREATING YOUR FIRST DISCOVERY MAP IN BLUEWORKS LIVE** Study of Process Life Cycle.
- 2. CREATING PROCESS MODEL IN BLUEWORKS LIVE.**
- 3. ADDING AND VIEWING PROCESS DETAILS IN BLUEWORKS LIVE**
- 4. ENTERPRISE DESIGN THINKING - LISTENING.**
- 5. ENTERPRISE DESIGN THINKING - HMW**
- 6. ENTERPRISE DESIGN THINKING - USER RESEARCH**
- 7. ENTERPRISE DESIGN THINKING – REFLECT**

- 8. ENTERPRISE DESIGN THINKING – IDEATION**
- 9. ENTERPRISE DESIGN THINKING – STORYBOARDING**
- 10. ENTERPRISE DESIGN THINKING - CRAFTING HILLS**
- 11. ENTERPRISE DESIGN THINKING – PROTOTYPING**

S.4 Computer System Organization (BTCS-404)

UNIT 1 Introduction for basic model of computer:

Brief History of computers, Von Newman architecture, Computer components, CPU, Memory, I/O, System Bus, registers, Program Counter, Accumulator, Register Transfer Language, Instruction Cycle, Instruction formats and addressing modes of basic computer. Basic arithmetic operations: addition, subtraction, multiplication, division, floating point arithmetic.

UNIT II Control Unit Organization:

Control unit operations - Address Sequencing & Micro operations, Hardwired control unit, Micro and Nano programmed control unit, Control Memory, Micro Instruction formats, Micro program sequencer, Micropogramming.

UNIT III Input Output Organization:

I/O Systems, Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, I/O processor, Introduction to 8085, 8085 I/O structure, 8085 instruction set and basic programming.

UNIT IV Memory organization:

Characteristics of Memory systems, Internal and External memories, Memory Hierarchy, High speed Memories: Cache Memory - Organization and mappings, Associative memory, Virtual memory: Segmentation, Paging, Address Translation Virtual to Physical. Secondary Storage: Magnetic Disk, Tape, DAT, RAID, Optical memory, CDROM, DVD.

UNIT V Multiprocessors:

Multiprocessor organization, Instruction level pipelining and Superscalar Processors , Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication, GPU.

Text Books:

- 1.Morris Mano, Computer System Architecture, Fourth edition, PHI, 2015.**
- 2.Tanenbaum, Structured Computer Organization, First Edition, Pearson Education, 2016.**
- 3.J P Hayes, Computer Architecture and Organizations, Third edition, Mc- Graw Hills, New Delhi, 2017**

Reference Books:

- 1.Gaonkar, Microprocessor Architecture, Programming, Applications with 8085, fifth Edition, Prentice Hall, 2015.**

- 2.William Stallings, Computer Organization and Architecture, Seventh Edition, PHI, 2009.
- 3.ISRD group, Computer Organization, Second edition, TMH, 2006.
- 4.Carter, Computer Architecture (Schaum), Third Edition, TMH, 2012.
- 5.Carl Hamacher, Computer Organization, Fifth Edition, TMH, 2002.

S.5 Agile Development Methodologies (DevOps + Agile) (BTIBM-202)

UNIT-I DevOps Fundamentals, Git, Maven, Docker: -

What is a Project: Project Definition, Project vs Operations, Project, Program and Portfolio Relationship, Project Features, Project Phases, Project Execution Methodologies: Waterfall Model, V-Model, Agile, Agile vs Waterfall. **Agile Deep Dive:** Agile Methodology Overview, Agile Manifesto Introduction and Guiding Principles, Agile Team Roles, Agile Frameworks. **DevOps Fundamentals:** Introduction to DevOps, Introduction to Continuous Integration/Continuous Delivery/Continuous Deployment, DevOps Tools-Git, Maven, Docker: Git, Maven, Docker.

UNIT-II Scrum framework, Scrum Artifacts: -

Scrum: Scrum Foundation, Scrum Team, Roles of Scrum Team, Sprints. **Scrum Artifacts:** Product Backlog, Sprint Backlog, Sprint Burndown chart, Impediment List, Product Increment.

UNIT-III Sprint Planning, Scrum Meetings, PBR, Sprint Goal, User Stories, Definition of Done, Team Velocity, Defect Density, Scrum Scaling, Scrum Practices, Scrum Vs Kanban, Xtreme Programming, Xtreme Programming vs Scrum: -

Scrum Ceremonies: Sprint Planning, Daily Scrum Meeting, PBR, Sprint Review. **Scrum Sprint Planning:** Sprint Goal, User Stories, Estimate User Stories, Definition of Done. **Scrum Metrics:** Sprint Goal Success, Team Velocity, Sprint Burn Down Charts, Defect Density, Scrum Scaling, Distributed Scrum Practices, Agile Environments and tools, Scrum vs Kanban, Xtreme Programming vs Scrum. **UNIT-IV Puppet, Jenkins, Junit, Nagios, Introduction of a Use case for CI/CD Pipeline, Problem Solving with DevOps:** -More on **DevOps Tools:** Puppet, Jenkins, Junit, Nagios. **DevOps Use Case:** Introduction of a Use-case for CI/CD Pipeline, Problem Solving with DevOps.

UNIT-V Advanced DevOps Concepts, Automatic Rollback, Automatic Provisioning, what is Cloud, IBM Cloud, DevOps using IBM Cloud: -

Advanced DevOps Concepts: Automatic Rollback, Automatic Provisioning. **Introduction to DevOps on IBM Cloud:** What is Cloud, IBM Cloud, DevOps Using IBM Cloud.

TEXTBOOKS:

1. Eric Ries, The Lean Startup, Publisher: Current, 1st edition, September 13, 2011
2. Roman Pichler, Agile Product Management with Scrum, Publisher: Addison Wesley, 1 st edition, 22 March 2010
3. Robert C. Martin, Clean Code: A Handbook of Agile Software Craftsmanship. Publisher : PHI; First edition , 25 September 2017

4. Anju Singhal, Jai Singhal, Book: Scrum Guide, Publisher: Agiliants Inc, First edition, 13 August 2013
5. Robert C. Martin, Agile Software Development, Principles, Patterns and Practices, Publisher: PHI; Subsequent edition 15 October 2002

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1. IBM Softcopy(ppt, pdf, docx)
2. <http://www.katacoda.com>
3. <https://www.edureka.co/blog/docker-commands/mirantis.com/tag/docker>
4. <https://www.scalyr.com/blog/create-docker-image/>
5. <https://www.howtoforge.com/tutorial/how-to-create-docker-images-with-dockerfile/>

LIST OF EXPERIMENTS:

1. Installation of GIT and Creating GIT Repository.
2. By which method we can supply a commit message to a commit? Describe in brief.
3. Write the way to check state of local git repository since last commit.
4. Give the command to initialize a new git repository.
5. Write the command that removes the target directory with all the build data before starting the build process.
6. Create a As-is scenario Map taking any example you like.
7. Creating a Maven Project.
8. Installation and setting up puppet.
9. Installing Docker and Creating Docker Image.
10. Process all docker commands.
11. Setting up DevOps on IBM Cloud.
12. For Designing a better way for cab booking from start to finish. Create a List of Stakeholders, Empathy Map and As-is Scenario Map
13. Create a 2-3 Sprint with entire team.
14. Create a To-be Scenario for any organization.
15. Discuss the empathy Map in design thinking

S.6 Programming Skills with 'C++' (BTCS-208)

UNIT I:

Object Oriented Programming: Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies.

UNIT II: Tokens, Expression and controls Structures:

Tokens , Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables. Operators in C++ : Scope resolution operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. Functions: The

main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III: Class and Object:

Introduction, Specifying a Class, Defining Member Functions, C++ Program with Class, Nesting of Member functions, Private Member Functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructor and Destructor: Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, and Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor, Operator overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators.

UNIT IV: Inheritance and Polymorphisms:

Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT V: I/O Operations and Files:

C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put(), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good().

Text Books:

1. E Balagurusamy, Object Oriented Programming with C++, 7Th Edition, Mc Graw Hill India, 2017.
2. Robert Lafore, Object Oriented Programming In C++, 4Th Edition, 2001.
3. David Parsons, Object Oriented Programming with C++; BPB publication, 2008.
4. Hubbard, Programming in C++ (Schaum), 3rd Edition, McGraw Hill Education, 2009.

Reference Books:

1. Herbert Schildt, The Complete Reference, 4th Edition, Tata McGraw-Hill Education Pvt. Ltd.,2000.
2. K R Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education, 2017.
3. Rajaram, R., Object Oriented Programming and C++, Second Edition, 2007
4. Saurav Sahay, Object Oriented Programming with C++, Oxford, 2006.

List of Practical:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76

- 2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.**
- 3. Write a function using reference variables as arguments to swap the values of a pair of integers.**
- 4. Write a macro that obtains the largest of 3 numbers.**
- 5. Define a class to represent a bank account. Include the following members:**

Data members

- 1. Name of the depositor**
- 2. Account number**
- 3. Type of account**
- 4. Balance amount in the account**

Member functions

- 1. To assign initial values**
- 2. To deposit an amount**
- 3. To withdraw an amount after checking the balance**
- 4. To display name and balance**

Write a main program to test the program.

- 7. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and odd one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.**
- 7. Design a constructor for bank account class.**

- 8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message “Required copies not in stock” is displayed.**

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.

- 9. Improve the system design in exercise 8 to incorporate the following features:**

(a) The price of the books should be updated as and when required. Use a private member function to implement this.

(b) The stock value of each book should be automatically updated as soon as a transaction is completed.

(c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.

- 10. Design a C++ Class „Complex“ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).**

- 11. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class**

account that stores customer name, account number and type of account. From this derive the classes curacct and savacct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

- a) Accept deposit from a costumer and update the balance.
- b) Display the balance
- c) Compute and deposit interest.
- d) Permit withdrawal and update the balance.
- e) Check for the minimum balance, impose penalty, necessary and update balance.

12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it the derived class to suit their requirements.

S.7 Communication Skills (HUCS-101)

UNIT I Communication:

Nature, Meaning, Definition, Verbal and Non Verbal Communication Barriers to Communication.

UNIT II Basic Language Skills:

Grammar and usage- Parts of Speech, Tenses, S-V Agreement, Preposition, Article.

UNIT III Basic Language Skills:

Types of Sentence, Direct - Indirect, Active - Passive voice, Phrases& Clauses. UNIT IV Business Correspondence: Business Letter, Parts & Layouts of Business Resume and Job application, E-mail writing.

UNIT V Report Writing:

Importance of Report, Types of Report, Structure of a Report.

Text & Reference Books:

1. Ashraf Rizvi.(2005).Effective Technical Communication. New Delhi: Tata McGraw Hill
2. Adair, John (2003). Effective Communication. London: Pan Macmillan Ltd.
3. A.J.Thomson and A.V.Martinet(1991).A Practical English Grammar(4th ed). New York: Oxford IBH Pub.
4. Kratz, Abby Robinson (1995). Effective Listening Skills. Toronto: ON: Irwin Professional Publishing.
5. Prasad, H. M. (2001) How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill.
6. Pease, Allan. (1998). Body Language. Delhi: Sudha Publications.

List of Practical:

- 1. Self-Introduction**
- 2. Reading Skills and Listening Skills**
- 3. Oral Presentation**
- 4. Linguistics and Phonetics**
- 5. JAM (Just a Minute)**
- 6. Group Discussion**

S.8 Data Structure and Algorithms (BTCS-403)

UNIT I Introduction:

Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations.
Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays. Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

UNIT II Linked List:

Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

UNIT III Stack:

The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi. The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV Tree:

Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion. Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V Sortings:

Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

Text books:

1. **Ashok N. Kamthane, “Introduction to Data structures”, 2nd Edition, Pearson Education India,2011.**
2. **Tremblay & Sorenson, “Introduction to Data- Structure with applications”, 8th Edition, Tata McGrawHill,2011.**
3. **Bhagat Singh & Thomas Naps, “Introduction to Data structure”, 2nd Edition, Tata McGrawHill 2009.**
4. **Robert Kruse, “Data Structures and Program Design”,2nd Edition,PHI,1997.**
5. **Lipschutz Seymour,”Data structures with C” ,1st Edition ,Mc- GrawHill,2017.**

Reference Books:

1. **Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.**
2. **ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.**
3. **E. Balagurusamy ,”Data Structure Using C” ,Tata McGraw-Hill 2017.**
4. **Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015**
5. **Gav Pai, Data Structures, Tata McGraw-Hill, 2015.**

List of Practical:

1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.
3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list
10. Program for implementation of Bubble sort
11. Program for Insertion sort
12. Program for Merge Sort
13. Program to implement Heap sort
14. Program to implement Quick sort
15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. To develop an algorithm for binary tree operations and implement the same.
17. To design an algorithm for sequential search, implement and test it.
18. To develop an algorithm for binary search and perform the same.

S.9 Agile Development Methodologies (BTIBM-201)

UNIT I Project Phase:

What is a project? , Definition of Project, Project vs Operations, Relationship between Project, Program, Portfolio Features of Project, Measuring Project Success, Phases of a Project, Project Execution Methodologies, Waterfall Model, How does Waterfall work? Where is Waterfall model suitable? Advantages, Disadvantages of Waterfall Model, V-Model, How does V-Model work? Where is V-model suitable? Advantages, Disadvantages of V-Model , Agile, How does Agile works? Where is Agile suitable, Advantages, Disadvantages of Agile, Agile Methodology Overview, Introduction to Agile Manifesto & Guiding Principles, Roles within Agile Team, Agile vs Waterfall, Agile Frameworks, Extreme Programming (XP), Rational Unified Process (RUP), Feature Drive Development (FDD), Test Driven Development (TDD), Scrum, Kanban, Introduction, Git Installation, Git Quick Start, Text Editor Installation, Basic Git Commands, Visual Merge/Diff Tool Installation.

UNIT II Agile and Scrum Deep Dive:

Scrum – Deep Dive, Foundations of Scrum, Scrum Diagram, Scrum Team, Roles in Scrum Team, Sprints, Definition of Ready, Scrum Artifacts, Product Backlog, Sprint Backlog, Sprint Burndown chart, Impediments List, Product Increment, Scrum Ceremonies, Sprint Planning, Daily Scrum Meeting, Product Backlog Refinement (PBR)/Grooming, Sprint Review / Demonstration meeting, Sprint Retrospective, Maven, Introduction, Simple Software Setup, Maven Project Creation and Key Concepts, Jira Introduction, How to Create Scrum & Kanban Boards.

UNIT III Scrum Artifacts, Ceremonies:

Scrum Sprint Planning , Sprint Goal, User Stories, Estimate User Stories, Definition of Done, Kanban Vs Scrum, Xtreme Programming Vs Scrum, DevOps Fundamentals, What is DevOps?, A definition of DevOps, Benefits of DevOps approach, Drivers of DevOps, Understanding the Business Need for DevOps, How is DevOps different from Traditional IT?, Issues in traditional application, Recognizing the Business Value of DevOps, Return on Investment, When to adopt / not adopt DevOps?, How is DevOps different from Agile? DevOps vs Agile, DevOps Principles , DevOps Lifecycle , Introduction Docker Commands, Docker Run, Docker Images, Jenkin Introduction , Jenkins Installation Process, Getting Started with Jenkins.

UNIT IV Scrum Sprint Planning and Matrices:

Sprint Goal, Benefits of Sprint Goal, Determine Sprint Goal, Sprint Goal Template, User Stories, Benefits of writing user stories, Estimate User Stories, What is a Story Point? Factors to be consider while estimating stories, Participants in story Point estimation, Advantages of using story points for estimating work , steps to estimate stories Definition of Done, Story Definition of Done ,Sprint Definition of Done, Release Definition of Done The evolving Definition of Done, Definition of Done common impediments, Sprint Goal Success, Team Velocity, Importance of velocity. Sprint Burn Down Chart Definition, Steps to read Burndown chart, Samples Burndown chart, Advantages of using Burndown charts, Advantages of defect density Factors that affect the defect density metrics.

UNIT V Scaling Scrum:

Scaling scrum, commonly used scaling frameworks, relationship between sprints and program increments, scrum@scale, product owner cycle, scrum master cycle, distributed scrum practices, distributed agile: good practices of successful teams, meeting face-to-face is the only way to build trust, establish a shared project vision, establish continuous integration (ci) with high test coverage across all teams, establish a synchronization and communication plan, establish a rigorous norming and chartering plan to achieve high quality use short sprints, scrum master at both locations, agile environments & tools, agile environments, the characteristics of an agile environment, the steps to create an agile environment, agile methodology tools, sprint ground, kanban vs scrum, differences between scrum and kanban, scheduling, extreme programming vs scrum

Text Books:

1. Eric Ries, **The Lean Startup**, Publisher: Current, 1st edition, September 13, 2011
2. Roman Pichler, **Agile Product Management with Scrum**, Publisher: Addison Wesley, 1 st edition, 22 March 2010
3. Robert C. Martin, **Clean Code: A Handbook of Agile Software Craftsmanship**. Publisher : PHI; First edition , 25 September 2017
4. Anju Singhal, Jai Singhal, Book: **Serum Guide**, Publisher: Agiliants Inc, First edition, 13 August 2013
5. Robert C. Martin, **Agile Software Development, Principles, Patterns and Practices**, Publisher: PHI; Subsequent edition 15 October 2002
6. IBM Book (By IBM)

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1. IBM Softcopy(ppt, pdf, docx)
2. <http://www.katacoda.com>
3. <https://www.edureka.co/blog/docker-commands/mirantis.com/tag/docker>
4. <https://www.scalyr.com/blog/create-docker-image/>
5. <https://www.howtoforge.com/tutorial/how-to-create-docker-images-with-dockerfile/>

S.10 Programming Skills with 'C++' (BTCS-208)

UNIT I: Object Oriented Programming:

Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies.

UNIT II: Tokens, Expression and controls Structures:

Tokens , Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables. Operators in C++ : Scope resolution operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. Functions: The main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III Class and Object:

Introduction, Specifying a Class, Defining Member Functions, C++ Program with Class, Nesting of Member functions, Private Member Functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructor and Destructor: Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, and Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor, Operator overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators.

UNIT IV: Inheritance and Polymorphisms:

Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes,

Virtual Functions, Pure Virtual Functions.

UNIT V: I/O Operations and Files:

C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put(), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good().

Text Books:

1. E Balagurusamy, Object Oriented Programming with C++, 7Th Edition, Mc Graw Hill India, 2017.
2. Robert Lafore, Object Oriented Programming In C++, 4Th Edition, 2001.
3. David Parsons, Object Oriented Programming with C++; BPB publication, 2008.
4. Hubbard, Programming in C++ (Schaum), 3rd Edition, McGraw Hill Education, 2009.

Reference Books:

1. Herbert Schildt, The Complete Reference, 4th Edition, Tata McGraw-Hill Education Pvt. Ltd.,2000.
2. K R Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education, 2017.
3. Rajaram, R., Object Oriented Programming and C++, Second Edition, 2007
4. Saurav Sahay, Object Oriented Programming with C++, Oxford, 2006.

List of Practical:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76
2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.
3. Write a function using reference variables as arguments to swap the values of a pair of integers.
4. Write a macro that obtains the largest of 3 numbers.
5. Define a class to represent a bank account. Include the following members:
Data members
 1. Name of the depositor
 2. Account number

3. Type of account
4. Balance amount in the account

Member functions

1. To assign initial values
2. To deposit an amount
3. To withdraw an amount after checking the balance
4. To display name and balance Write a main program to test the program.

6. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and odd one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

7. Design a constructor for bank account class.

8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message "Required copies not in stock" is displayed.

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.

9. Improve the system design in exercise 8 to incorporate the following features:

(a) The price of the books should be updated as and when required. Use a private member function to implement this.

(b) The stock value of each book should be automatically updated as soon as a transaction is completed.

(c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.

10. Design a C++ Class „Complex“ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

11. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class account that stores customer name, account number and type of account. From this derive the classes curacct and savacct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

a) Accept deposit from a costumer and update the balance.

b) Display the balance

c) Compute and deposit interest.

d) Permit withdrawal and update the balance.

e) Check for the minimum balance, impose penalty, necessary and update balance.

12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle from the base

shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it the derived class to suit their requirements.

- Sem 3

S.1 Discrete Structures (BTIT-401)

UNIT I Set Theory:

Definition Of Sets, Venn Diagrams, Complements, Cartesian Products, Power Sets, Counting Principle, Cardinality and Countability (Countable And Uncountable Sets), Proofs of Some General Identities on Sets, Pigeonhole Principle. Relation: Definition, Types of Relation, Composition of Relations, Domain and Range of a Relation, Pictorial Representation of Relation, Properties of Relation, Partial Ordering Relation. Function: Definition and Types of Function, Composition of Functions, Recursively Defined Functions.

UNIT II Propositional Logic:

Proposition Logic, Basic Logic, Logical Connectives, Truth Tables, Tautologies, Contradiction, Normal Forms (Conjunctive and Disjunctive), Modus Ponens and Modus Tollens, Validity, Predicate Logic, Universal and Existential Quantification. Notion of Proof: Proof by Implication, Converse, Inverse, Contrapositive, Negation, and Contradiction, Direct Proof, Proof by Using Truth Table, Proof by Counter Example

UNIT III Graph Theory:

Terminology Graph Representation Graph Isomorphism; Connectedness; Various Graph Properties; Euler and Hamiltonian Graph; Shortest Paths Algorithms. Trees: Terminology, Tree Traversals; Prefix Codes, Spanning Trees, Minimum Spanning Trees.

UNIT IV Algebraic Structure:

Binary Composition and its Properties Definition of Algebraic Structure; Groyas Semi Group, Monoid Groups, Abelian Group, Properties of Groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (Definition and Standard Results).

UNIT V Posets, Hasse Diagram And Lattices:

Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded and Complemented Lattices. Combinatorics: Introduction, Permutation and Combination, Binomial Theorem, Multinomial Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive Algorithms, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions, Generating Functions, Solution by Method of Generating Functions.

Text Books:

1. C.L.Liu, “Elements of Discrete Mathematics”,4th Edition, Tata McGraw-Hill, 2012.

2. Kenneth H. Rosen, "Discrete Mathematics and its applications", 7th Edition,Tata McGraw-Hill, 2012.
3. V. Krishnamurthy, "Combinatorics: Theory and Applications", 2nd Edition,East-West Press, 2008.
4. Seymour Lipschutz, M.Lipson, "Discrete Mathemataics",3rd Edition, Tata McGraw Hill, 2009.

Reference Books:

1. Trembley, J.P & Manohar; "Discrete Mathematical Structure with Application CS", Tata McGraw Hill.
2. Bisht, "Discrete Mathematics", Oxford University Press, 2015.
3. Biswal,"Discrete Mathematics & Graph Theory",3rd Edition, PHI, 2011.

S.2 Data Communication (BTCS-302)

UNIT I Introduction:

Data Communication Components, Types of Connections, Transmission Modes, Network Devices, Topologies, Protocols and Standards, OSI Model, Transmission Media, Bandwidth, Bit Rate, Bit Length, Baseband and Broadband Transmission, Attenuation, Distortion, Noise, Throughout, Delay and Jitter.

UNIT II Data Encoding:

Unipolar, Polar, Bipolar, Line and Block Codes. Multiplexing: Introduction and History, FDM, TDM, WDM, Synchronous and Statistical TDM. Synchronous and Asynchronous transmission, Serial and Parallel Transmission.

UNIT III Error Detection & Correction:

Correction, Introduction–Block Coding–Hamming Distance, CRC, Flow Control and Error Control, Stop and Wait, Error Detection and Error Go Back– N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, CSMA/CD, CDMA/CA

UNIT IV Network Switching Techniques:

Circuit, Message, Packet and Hybrid Switching Techniques.X.25, ISDN. Logical Addressing, Ipv4, Ipv6, Address Mapping, ARP, RARP, BOOTP and DHCP, User Datagram Protocol, Transmission Control Protocol, SCTP.

UNIT V Application Layer Protocols:

Domain Name Service Protocol, File Transfer Protocol, TELNET, WWW and Hyper Text Transfer Protocol, Simple Network Management Protocol, Simple Mail Transfer Protocol, Post Office Protocol v3.

Text books:

1. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw Hill, 2011.

Reference Books:

1. Larry L.Peterson, Peter S. Davie, "Computer Networks", Fifth Edition, Elsevier, 2012.
2. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2007.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top–Down Approach Featuring the Internet", Pearson Education, 2005.

S.3 Analysis and Design of Algorithms (BTIT-305)

UNIT 1 Algorithms Designing:

Algorithms, Analyzing Algorithms, Asymptotic Notations, Heap and Heap Sort, Brief Review of Graphs, Sets and Disjoint Set Union, Sorting and Searching Algorithms and their Analysis in terms of Space and Time Complexity. Divide and Conquer: General Method, Binary Search, Merge Sort, Quick Sort, Selection Sort, Strassen's Matrix Multiplication Algorithms.

UNIT II Greedy Method:

General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths. UNIT III Dynamic Programming: General Method, Optimal Binary Search Trees, O/1 Knapsack, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV Backtracking:

General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets. Branch and Bound: Method, O/1 Knapsack Problem, Traveling Salesperson Problem, Efficiency Considerations, Techniques for Algebraic Problems, Some Lower Bounds on Parallel Computations.

UNIT V NP Hard and NP Complete Problems:

Basic Concepts, Cook's Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamental of Computer Algorithms", 2 nd Edition, Galgotia Publication, 2001.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest "Introduction to Algorithms", 3 rd Edition, MIT Press. 2009.
3. Donald E Knuth, "Fundamentals of Algorithms: The Art of Computer Programming" Vol 1, 3rd Edition, Pearson Education, 1997.

Reference Books:

1. Goodman, S.E. & Hedetnieni, "Introduction to Design and Analysis of Algorithm", Tata McGraw Hill, 1977.
2. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms", Tata McGraw Hill, 2006.
3. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms" TMH Publication.
4. Michael T Goodrich and Robarto Tamassia "Algorithm Design", Wiley India.

List of Practical:

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for minimum spanning trees using Kruskal's algorithm.
6. Write a program for minimum spanning trees using Prim's algorithm.
7. Write a program for single sources shortest path algorithm.
8. Write a program for Floyd-Warshall algorithm.

9. Write a program for traveling salesman problem.
10. Write a program for Hamiltonian cycle problem.

S.4 Cloud Computing: Project Based Learning (BTIBM-401)

UNIT I :

CLOUD COMPUTING LANDSCAPE

- Cloud impact in our lives
- Cloud enterprise adoption
- Cloud services
- Summary & resources

CLOUD INDUSTRY ADOPTION

- Drivers for Digital Transformation
- Cloud Impact in Banking
- Cloud Impact in Education
- Summary & resources

UNIT II:

API PLATFORM REVOLUTION

- Cloud Culture of Change
- API Platforms Landscape
- APIs driving the Cloud platform revolution
- Summary & resources

UNIT III:

DATA IN THE CLOUD

- Where and how will data be used?
- Why use NoSQL?
- Attributes of NoSQL databases

- Summary & resources

UNIT IV:

CLOUD AND AI

- AI Industry Adoption
- AI Evolution
- Empowered Cloud Apps with AI Summary & resources CLOUD FOR MULTI-CHANNEL
- The Need for a Multi-channel platform • Multi-channel platform characteristics
- Rapid and Intelligent Summary and resources

UNIT V:

CLOUD SECURITY

- Cloud Security landscape
- Security concerns in microservices
- OAuth protocol Summary & resources

DEVOPS FRAMEWORK

- What is DevOps?
- DecOps Agile Culture
- DevOps Lifecycle

Text Books:

1. **Cloud Computing Bible by Barrie Sosinsky, 2010**
2. **Cloud Computing: Concepts, Technology & Architecture by Zaigham Mahmood, Ricardo Puttini, Thomas Erl, 2013**

Reference Books:

1. **Cloud Computing: Saas, Paas, Iaas, Virtualization, Business Models, Mobile, Security and More by Dr Kris Jamsa , 2012**
2. **Cloud Computing Paperback – 2019**
3. **by Mehul Mahrishi Kamal Kant/Ruchi Doshi/ Temitayo Fagbola**
4. **Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, 1e Paperback – 2008 by Miller**
5. **IBM Skills Academy (PDF Provided by IBM)**

List of Practical:

- Create an IBM Cloud Account

ACME AIRLINE CLOUD ADOPTION

- Prepare your Environment
- Creating an APP
- Developing an App
- Acme Business Case- Preparing the APP
- Prepare Your Environment

- **Creating an App**
 - **Developing an App**
 - **Acme Business Case – Preparing the App MAINTENANCE CREW CLOUD APP**
 - **Digital App Builder Data Sets**
 - **Cloud Management**
 - **Return to the Digital App Builder**
 - **Preview Dataset in Action**

ADD AI TO MAINTENANCE CREW APP
 - **Create Cloud Cognitive Services**
 - **Connect Services to your App**
 - **Train and Implement Cognitive Services**

ADD MULTI-CHANNEL SUPPORT
 - **Android Studio • Enabling Android in Digital App Builder**
 - **Preview your APP in Android Device**

SECURE THE MAINTENANCE CREW APP
 - **Login Security**
 - **Mobile Phone Authorization**
 - **Test new security functionality**
- EXPLORE TOOLCHAINS**
- **Enable Toolchains**
 - **Create and Explore the Garage Method**
 - **Finalize the Creation of Toolchain**
-
- **Agile Planning**
 - **Continuous Integration and Delivery**
 - **Manage IBM Cloud Apps**
 - **Manage App Using New Relic & PagerDuty**
 - **Slack and PagerDuty Integration**
 - **Learn from Users**
- DEVELOP & TEST MICROSERVICES**
- **Create Microservices Toolchain**
 - **Configure Tool Integrations**
 - **Configure Tool Integrations**
 - **View Build & Deployment Activity**
 - **Manager Access • Configure Pager Duty**
 - **Submit an Issue**
 - **Modify Code IDENTIFY AN ERROR**
 - **Fix the Problem and Deploy**
 - **Fix the Problem and Deploy**
 - **Explore the DevOps Insights**
 - **Improve Deployment Management**
 - **Improve Visibility**
 - **Delete Tools and Artifacts**

UNIT I The Java Environment:

Basic History of Java and its Features, JVM, JRE and JDK, its Libraries and Functionalities, Why Java? Installing Java, Java Classes and Objects, Variables and Data Types Conditional and Looping Constructs, Arrays.

UNIT II The Java Language:

Constructors, Inheritance, Packages and Interfaces, Access Specifier, Enumerations, Auto boxing, and Annotations (Metadata) Garbage collection, Nested Classes, Inner Classes

UNIT III Performance:

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, The Idea Behind Exception, Exceptions and Errors, Types of Exception, Control Flow in Exceptions, JVM Reaction to Exceptions, Use of Try, Catch, Finally, Throw, Throws in Exception Handling, In-Built and User Defined Exceptions, Checked and Un Checked Exceptions, Generics, Lambda Expressions.

UNIT IV The Java Library:

String Handling, Exploring Java.Lang, Java.Util – The Collection Framework, Exploring Java.IO, Exploring Java. NIO.

UNIT V Database Connectivity with JDBC:

Introduction to JDBC, JDBC Drivers & Architecture, CRUD Operation using JDBC

Text Books:

1. Kishore Sharan, “Beginning Java 8 Language Features”, Apress, 2014
2. E. Balagurusamy, “Programming with java A Primer”, Fourth Edition, Tata McGraw Hill, 2009.
3. Sharanam Shah, “Core Java 8 for Beginners”, Shroff Publisher, 2015.

Reference Books:

1. Herbert Schildt, “The Complete Reference Java”, Ninth Edition, McGraw Hill, 2014
2. Bert Bates, Kathy Sierra, “Head First Java”, 2nd Edition, O’ Reilly, 2005
3. Cay S Horstman and Gary Cornell, “Core Java”, Vol I & II, Pearson Education, 2013

List of Practical:

1. Write a program to show concept of Class in Java?
2. Write a program showing Type Casting
3. Write a program showing Different type of inheritance
4. Write a program showing Different types of Polymorphism
5. Write a program showing Encapsulation
6. Write a program showing Abstraction
7. Write a Multithreaded program
8. Write a program showing Checked and Unchecked Exception
9. Write a program showing Database connectivity.
10. Write a program showing Simple database Operation (CRUD)

UNIT-I Introduction to UNIX –

The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal and External Commands, Command Structure. General purpose utilities: cal, date, echo, printf, bc, script, passwd, path, who, uname, tty, stty, pwd, cd, mkdir, rmdir, od.

UNIT-II Handling Files and C Environment –

The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount, chmod, The vi editor ,security by file Permissions. Networking commands: ping, telnet, ftp, finger, arp, rlogin. The C compiler, vi editor, compiler options, and run the programs.

UNIT-III: Shell Basics –

Types of shells, Shell Functionality, Work Environment, Writing script & executing basic script, Debugging script, Making interactive scripts, Variables (default variables), Mathematical expressions. Conditional statements: If-else-elif, Test command, Logical operators - AND, OR, NOT, Case –esac. Loops: While, For, Until, Break & continue.

UNIT-IV: Command Line Arguments & Regular Expression –

Command line arguments,Positional parameters, Set & shift, IFS. Functions & file manipulations: Processing file line by line, Functions. Regular Expression & Filters: Regular expression, Grep, cut, sort commands, Grep patterns.

UNIT-V: SED and AWK –

SED,Scripts, Operation, Addresses, commands, Applications, grep and sed. AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

Text Books:

1. Stephen Prata “Advanced UNIX: A Programming's Guide”, BPB Publications, 2017.
2. Maurice J. Bach “Design of UNIX O.S. ”, PHI Learning, 2015.
3. Brian W. Kernighan & Robe Pike, “The UNIX Programming Environment”, PHI Learning, 2015.
4. Sumitabha Das: “YOUR UNIX – The Ultimate Guide”, Tata McGraw Hill, 23rdreprint, 2012.
5. Yashavant Kanetkar, “Unix Shell programming”, 1st Edition, BPB Publisher, 2010.

Reference Books:

1. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and Shell Programming”, 1st Edition, Cengage Learning India, 2003.
2. Graham Glass, King Ables, “Unix for programmers and users”, 3rd Edition, Pearson Education, 2009.
3. Sumitabha Das, “Unix Concepts and Applications”, 4th Edition. TMH, 2006.
4. N.B. Venkateswarlu, “Advanced Unix programming”, 2nd Edition, B S Publications, 2010.

List of Practical:

- 1. Perform installation of UNIX/LINUX operating system.**
- 2. Study of UNIX general purpose utility commands.**
- 3. Execution of various file/directory handling commands.**
- 4. Working with the vi editor: Creating and editing a text file with the vi text editor using the standard vi editor commands.**
- 5. Write a shell script for calculator (to perform basic arithmetic and logical calculations).**
- 6. Write a shell script sum.sh that takes an unspecified number of command line arguments (up to 9) of ints and finds their sum. Modify the code to add a number to the sum only if the number is greater than 10.**
- 7. Write a shell script that will take an input file and remove identical lines (or duplicate lines from the file).**
- 8. Write a shell script takes the name a path (eg: /afs/andrew/course/15/123/handin), and counts all the sub directories (recursively).**
- 9. Shell scripts to explore system variables such as PATH, HOME etc.**
- 10. Write a shell script that takes a name of a folder as a command line argument, and produce a file that contains the names of all sub folders with size 0 (that is empty sub folders)**
- 11. Execution of various system administrative commands.**
- 12. Write awk script that uses all of its features.**
- 13. Write a shell script to display list of users currently logged in.**
- 14. Write a shell script to delete all the temporary files.**
- 15. Write a shell script to search an element from an array using binary searching.**
- 16. Write shell script to perform different string operations of arrays.**

S.7 Web Development Lab-II (PHP/JSP) (BTIT-407)

UNIT-I Introduction to PHP:

Identify Relationship Between Apache, Mysql and PHP, Steps to Install and Test Web Server, Configure Apache to Use PHP, Create Simple PHP Page Using PHP Structure and Syntax, Use of PHP Variables, Data Types and PHP Operators, Apply Control Structures in Programming, Steps to Create User Defined Functions.

UNIT-II Working with in Built Functions:

Apply Various Inbuiltvariable(Gettype, Settype, Isset, Strval, Floatval, Intval, Print_R), String(Chr, Ord, Strtolower, Strtoupeer, Strlen, Ltrim, Rtrim, Trim, Substr, Strem, Strcasecmp, Crops, Strops, Stristr, Str_Replace, Strrev, Echo, Print), Math(Abs, Ceil, Floor, Round, Fmod, Min, Max, Pow, Sqrt, Rand), Date (Date, Getdate, Setdate, Checkdate, Time, Mktime), Array(Count, List, In_Array, Current, Next, Previous, End, Each, Sort, Array_Merge, Array_Reverse), File Functions(Fopen, Fread, Fwrite, Fclose)in Programming .

UNIT-III: Working With Data And Forms:

Steps to Create an Input Form (Text Fields, Text Areas, Check Boxes, Radio Buttons, List Boxes, Password Controls, Hidden Controls, Image Maps, File Uploads, Buttons), Steps to Use Using PHP\$_Get And \$_Post, \$_Request Method for a Given Application, Combining HTML and PHP Codes Together on Single Page, Redirecting the User.

UNIT-IV: Session, Cookies And Error Handling:

Use Cookie to Store and Retrieve Data, Use Querystring to Transfer Data, Create Session Variable and Handle Session, Starting and Destroying Session Working with Session Variables, Passing Session IDs, Handle Runtime Errors Through Exception Handling, Error Types in PHP. Database Connectivity Using MYSQL:Concepts and Installation Of Mysql, Mysql

Structure and Syntax, Types of Mysql Tables and Storage Engines, Mysql Commands, Integration of PHP with Mysql, Connection to the Mysql Database, Creating And Deleting Mysql Database Using PHP, Updating, Inserting, Deleting Records in the Mysql Database, Hosting Website (Using “C” Panel, Using FileZilla Software)

UNIT-V: Java Server Pages Basics:

Integrating Scripts in JSP, JSP Objects and Components, Configuration and Troubleshooting, JSP: Request and Response Objects, Retrieving the Contents of An HTML Form, Retrieving a Query String, Working with Beans, Cookies, Creating and Reading Cookies. Using Application Objects and Event Handling.

Text Books:

1. W. Jason Gilmore, “Beginning PHP and MySQL”, 4th Edition, Apress, 2010
2. Steven Holzner, “PHP: The Complete Reference”, Tata McGraw-Hill, 2008
3. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5”, Third Edition, O’reillyMedia, 2014

Reference Books:

1. Julie C. Meloni, “Teach yourself PHP, MySQL and Apache All in one”, 5th Edition, Pearson Education, 2012
2. Phil Hanna, “JSP 2.0: The Complete Reference”, Tata McGrawHill, 2011.

List of Practical’s:

1. Write a PHP script to display Welcome message.
2. Write a PHP script to demonstrate arithmetic operators, comparison operator, and logical operator.
3. Write PHP Script to print Fibonacci series.
4. Write PHP script to demonstrate Variable function
5. Write PHP script to demonstrate string function.
6. Write PHP script to demonstrate Array functions.
7. Create student registration form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.
8. Write two different PHP script to demonstrate passing variables through a URL.
9. Write PHP script to demonstrate passing variables with cookies.
10. Write an example of Error-handling using exceptions.
11. Write a PHP script to connect MySQL server from your website.
12. Write a program to read customer information like cust_no, cust_name, item_purchase, and mob_no, from customer table and display all these information in table format on output screen.
13. Write a program to read employee information like emp_no, emp_name, designation and salary from EMP table and display all this information using table format.
14. Create a dynamic web site using PHP and MySQL.
15. Write a program for JSP scriptlet tag that prints the user name
16. Write a program for JSP expression tag that prints current time
17. Write a program for JSP declaration tag that declares method
18. Write a program for JSP for request and response implicit object
19. Write a program for JSP for session implicit object
20. Write a program for JSP for exception implicit object
21. Write a program for JSP for Simple example of java bean class
22. Write a program for JSP for JSP Action Tags

S.8 Computational Learning (AI) (BTAI-301)

UNIT I Probabilistic Reasoning:

Probabilistic Reasoning, Prior, Likelihood and Posterior, Probabilistic Inference in Structured Distributions, Belief Networks: Conditional independence, d-Separation, d-Connection and dependence, Markov equivalence in belief networks, Belief networks - limited impressibility.

UNIT II Distributions:

Distributions, Estimator Bias, Discrete Distributions, Continuous Distributions, Multivariate Distributions, Multivariate Gaussian, Exponential Family, The Kullback-Leibler Divergence. Mixture Models: The Gaussian Mixture Model.

UNIT III Learning as Inference:

Learning as Inference, Maximum A Posteriori and Maximum Likelihood, Maximum Likelihood for Undirected models, Properties of Maximum Likelihood, Naive Bayes and Conditional Independence, Bayesian Naive Bayes. Density Estimation: Limit Theorem, Parzen Windows, Exponential Families, Naive Bayes Estimation using Maximum Likelihood

UNIT IV Learning with Hidden Variables:

Learning with Hidden Variables; Hidden Variables and Missing Data, Expectation Maximization, Extensions of EM, Optimizing the Likelihood by Gradient Methods. Optimization: Optimization Unconstrained Smooth Convex Minimization, Constrained Optimization, Stochastic Optimization, Non-convex Optimization

UNIT V Hypothesis Testing:

Hypothesis Tests for Two classes, Error Probability in Hypothesis Testing, Upper Bounds on the Bayes Error, Sequential Hypothesis Testing.

Text Books:

1. David Barber, **Bayesian Reasoning and Machine Learning**, Cambridge University Press, 2010
2. Andrew R. Webb, **Statistical Pattern Recognition**, Second Edition, John Wiley & Sons, Ltd., 2002
3. Alex Smola and S.V.N. Vishwanathan, **Introduction to Machine Learning**, Cambridge University Press 2008

Reference Books:

1. Luc Devroye, Laszlo Gyorfi and Gabor Lugosi, **A Probabilistic Theory of Pattern Recognition**, Springer, 1996
 2. Keinosuke Fukunaga, **Introduction to Statistical Pattern Recognition**, Second Edition, Morgan Kaufmann, 1990
 3. Christopher M. Bishop, **Pattern Recognition and Machine Learning**, Springer, 2006
- S.9 Principles of Programming Languages (BTCS-303)

UNIT I Preliminary Concepts:

Reasons for Studying, Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming , Logic Programming.

Programming Language Implementation – Compilation and Virtual Machines, Programming Environments.

UNIT II Data Types:

Introduction, Primitive, Character, User Defined, Array, Associative, Record, Union, Pointer and Reference Types, Design and Implementation Uses Related to these Types. Names, Variable, Concept of Binding, Type Checking, Strong Typing, Type Compatibility, Named Constants, Variable Initialization.

UNIT III Expressions and Statements:

Arithmetic Relational and Boolean Expressions, Short Circuit Evaluation Mixed Mode Assignment, Assignment Statements, Control Structures – Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, Guarded Commands.

UNIT IV Subprograms and Blocks:

Fundamentals of Sub-Programs, Scope and Lifetime of Variable, Static and Dynamic Scope, Design Issues of Subprograms and Operations, Local Referencing Environments, Parameter Passing Methods, Overloaded Sub-Programs, Generic Sub-Programs, Design Issues for Functions Overloading and Overloaded Operators, Co-Routines.

UNIT V Abstract Data Types:

Abstractions and Encapsulation, Introductions to Data Abstraction, Static and Stack Based Storage Management. Heap Based Storage Management. Garbage Collection. Object Oriented Programming in Smalltalk, C++, Java, C#, Php, Perl. Concurrency: Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, C# Threads.

Text Books:

1. Robert .W. Sebesta —**Concepts of Programming Languages**®, 10th Edition, Pearson Education,2008.
2. D. A. Watt, —**Programming Language Design Concepts**, Wiley dreamtech, rp-2007.
3. Louden and Lambart,—**Programming Languages: Principles and Practices**®, 3rd Edition, Cengage Learning, 2011

Reference Books:

1. Gabbrielli and Martini —**Programming Languages: Principles and Paradigms**., Springer, 2010.
2. Peter Sestoft,—**Programming Language Concepts**®, Springer, 2017.
3. A.B. Tucker, R.E. Noonan, —**Programming Languages**®, 2nd Edition, Tata McGraw Hill.
4. Terrance W Pratt, "Programming Languages: Design and Implementation" Pearson Education.

List of Practical:

1. Type compatibility rules of a C compiler.
2. Compare time efficiency to run for matrix multiplication with and without subscript range checking.
3. Investigate the safety of enumeration types. Perform at-least 5 operations to determine what incorrect or silly things are legal.

4. Calculate time efficiency for large number of references to two dimensional array between subscripting and pointer arithmetic
5. Illustrates the order of evaluation of expressions used as actual parameters to a method.
6. Consider the following programming problem: The values of three integer variables—first, second, and third—must be placed in the three variables max, mid, and min, with the obvious meanings, without using arrays or user-defined or predefined subprograms. Write two solutions to this problem, one that uses nested selections and one that does not. Compare the complexity and expected reliability of the two.
7. Produces different behavior depending on whether pass-by-reference or pass-by-value result is used in its parameter passing.
8. Write a program in some language that has both static and stack dynamic local variables in subprograms. Create six large (at least $100 * 100$) matrices in the subprogram—three static and three stack dynamic. Fill two of the static matrices and two of the stackdynamic matrices with random numbers in the range of 1 to 100. The code in the subprogram must perform a large number of matrix multiplication operations on the static matrices and time the process. Then it must repeat this with the stack-dynamic matrices. Compare and explain the results.
9. Write an abstract data type for complex numbers, including operations for addition, subtraction, multiplication, division, extraction of each of the parts of a complex number, and construction of a complex number from two floating-point constants, variables, or expressions.
10. Define semaphores in Ada and use them to provide both cooperation and competition synchronization in the shared-buffer example
11. Prepare a case study on C and C++ for Readability, Writability and. Reliability

S.10 Object Oriented Programming Using Java (BTCS-308)

UNIT I:

Object-Oriented Approach State the advantages of an object-oriented approach to software development, Describe essential object-oriented concepts and terminology, Describe the fundamentals of object-oriented programming

UNIT II:

JAVA Classes with Object Oriented Approach Create Java classes that implement an object-oriented design, Apply Java language constructs that enable and enforce OO-related concepts such as data encapsulation, strict typing and type conversion, inheritance, and polymorphism. Use Java syntax to develop applications in Java, Use inheritance and interfaces in Java applications, Refactor Java code.

UNIT III:

API classes and interfaces Describe and use some of the important API classes and interfaces available in Java, including: Primitive wrapper classes, Classes in the Collections Framework, Utility classes, I/O classes, Threads, Exceptions

UNIT IV:

Java development tools in Eclipse V3.5 Use the Java development tools in Eclipse V3.5, Debug Java programs, Describe Java EE component model and its use in building server- side applications, Develop, debug, and test server-side applications.

UNIT V:

Servlet & JSP Develop and test servlets, Develop and test JSP pages, Learn how to use JSPs and servlets in accordance with the Model/View/Controller(MVC) programming model, Develop, test, and use JSP custom tags

- Sem 4

S.1 Environment and Energy Studies (ML-301)

UNIT I Environmental Pollution and Control Technologies:

Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and industrial pollution, Ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid Waste management composition and characteristics of e - Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, Secondary and Tertiary.

UNIT II Natural Resources: Classification of Resources:

Living and Non - Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problem, **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable energy source, case studies.

UNIT III Ecosystems:

Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. **Energy flow in the ecosystem,** Biogeochemical cycles, Bioaccumulation, ecosystem value, devices and carrying capacity, Field visits.

UNIT IV Biodiversity and its Conservation:

Introduction - Definition: genetic, species and ecosystem diversity. **Bio-geographical classification of India - Value of biodiversity:** consumptive use, productive use, social, ethical, aesthetic and option values - . **Biodiversity at global, National and local levels.** - . **India as a megadiversity nation - Hot-spots of biodiversity - Threats to biodiversity:** habitat loss, poaching of wildlife, manwildlife conflicts; **Conservation of biodiversity:** In-situ and Exsitu conservation. **National biodiversity act.**

UNIT V Environmental Policy, Legislation & EIA:

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. **EIA:** EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP).

Text Books:

1. Agarwal, K.C.,(latest edition).Environmental Biology, Bikaner :Nidi Pub. Ltd.
2. Brunner R.C.(latest edition) Hazardous Waste Incineration, McGraw Hill Inc.
3. Clank R.S. .,(latest edition. Marine Pollution, Clanderson Press Oxford (TB).
4. De A.K(latest edition) Environmental Chemistry, Wiley Western Ltd.

5. ErachBharucha(2005).Environmental Studies for Undergraduate Courses by for University Grants Commission.

Reference Books:

1. R. Rajagopalan(2006).Environmental Studies. Oxford University Press.
2. M. AnjiReddy(2006).Textbook of Environmental Sciences and Technology. BS Publication.
3. Richard T. Wright(2008).Enviromental Science: towards a sustainable future PHL Learning Private Ltd. New Delhi.
4. Gilbert M. Masters and Wendell P. Ela.(2008).Environmental Engineering and science. PHI Learning Pvt Ltd.
5. Daniel B. Botkin& Edwards A. Keller(2008).Environmental Science Wiley INDIA edition.
6. AnubhaKaushik(2009).EnviromentalStudies. New age international publishers.

S.2 Computer Networks(BTIT-502)

UNIT I Computer Network:

Definitions, Goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, TCP/IP model overview, Descriptions of various layers and its comparison with TCP/IP. Network standardization.

UNIT II Data Link Layer:

Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB.

UNIT III MAC Sublayer:

Overview of MAC Layer, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11 wireless Communication.

UNIT IV Network Layer:

Need, Services Provided, Design issues, Routing and congestion in network layer, wired & wireless routing protocol examples, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multi cast Routing. IP protocol, IP Addresses, subnetting, Comparative study of IPv4 & IPv6, Mobile IP.

UNIT V Transport Layer:

Overview, Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Session layer: Overview, Authentication, Session layer protocol. Presentation layer: Overview, Data conversion, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler).Application Layer: Overview, WWW and HTTP, FTP, SSH.

Text Books:

1. Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.
2. Behrouz A. Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
3. William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
4. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
5. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

Reference Books:

1. Kaveh Pahlavan, Prashant Krishnamurthy, Networking Fundamentals, Wiley Publication, 2009.
2. Michael A. Gallo & William M. Hancock, Computer Communications & Networking Technologies, Cengagepearson publications, 2001.
3. Dimitri Bertsekas, Robert Gallager, Data Networks, PHI Publication, Second Edition, 1992.
4. Ulysses Black, Computer Networks, PHI Publication, Second Edition, 1993.

List of Practical:

1. Demonstrate Different Types of Network Equipment's.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.
4. Experiment with basic network command and Network configuration commands.
5. Examine network IP.
6. Write a program to implement various types of error correcting techniques.
7. Write a program to implement various types of farming methods.
8. Implement & simulate various types of routing algorithm.
9. Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
10. Simulate STOP AND WAIT Protocols on NS-2.
11. Simulate various Routing Protocol on NS-2.
12. Simulate various Network Topologies on NS-2.
13. Configuring routers, bridges and switches and gateway on NS-2.

S.3 Operating Systems (BTCS-502)**UNIT I Introduction to Operating System:**

Introduction and Need of operating system, Layered Architecture/Logical Structure of Operating system, Type of OS(Multiprogramming , Time Sharing, Real Time ,Networked, Distributed, Clustered, Hand Held), Operating system as Resource Manager and Virtual Machine, OS Services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader. Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

UNIT II Process Management:

Process Model, Creation, Termination, States & Transitions, Hierarchy, Context Switching, Process Implementation, Process Control Block, Basic System calls- Linux & Windows. Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority

Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling

UNIT III Interprocess Communication:

Introduction to Message Passing, Race Condition, Critical Section Problem, Peterson's Solution, Semaphore, Classical Problems of Synchronization Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Sleeping Barber Problem etc. Deadlock-System model, Resource types, Deadlock Problem, Deadlock Characterization, Methods for Deadlock Handling, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock Detection, Recovery from Deadlock.

UNIT IV Memory Management:

concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit and quick fit. Free space management- bitmap, link list/free list. Virtual Memory- concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging ,working set model, page fault frequency, thrashing, page replacement algorithms- optimal, FIFO, LRU; Bready's anomaly; TLB (translation look aside buffer).

UNIT V File Management:

Concepts, Naming, Attributes, Operations, Types, Structure, File Organization & Access (Sequential, Direct, Index Sequential) Methods, Memory Mapped Files, Directory Structures One Level, Two Level, Hierarchical/Tree, Acyclic Graph, General Graph, File System Mounting, File Sharing, Path Name, Directory Operations, Overview Of File System in Linux & Windows. Input/output Subsystems- Concepts, Functions/Goals, Input/Output devices- Block And Character, Spooling, Disk Structure & Operation, Disk Attachment, Disk Storage Capacity, Disk Scheduling Algorithm- FCFS, SSTF, Scan Scheduling, C-Scan Schedule.

Text books:

1. Abraham Silberschatz, "Operating system concepts", 10th Edition, John Wiley & Sons. INC, 2018
2. Andrew S. Tannanbaum, "Modern operating system", 4th Edition, Pearson Education, 2014
3. Dhananjay M. Dhamdhere, "Operating Systems: A concept Based Approach", 3rd Edition TMH, 2017,
4. Sibsankar Haldar, Alex Alagarsamy Aravind, "Operating System", 8 th Edition, Pearson Education India,, 2010

Reference Books:

1. Achyut S Godbole, "Operating System", 3rd TMH, 2017.
2. William Stalling, "operating system" 8th, Pearson Education, , 2014.
3. Vijay Shukla, "Operating System", 3rd, Kataria&Sons , 2013.
4. Singhal&Shivratri, "Advanced Concept in Operating Systems", 1st , TataMc-Graw Hill Education, edition 2017.

List of Practical:

1. Implement and update the BIOS settings of your PC.

2. If there are 5 printers are connected in a system each process to print will take different time to complete, and CPU will give a fixed time to each process after that deadline next process will enter in CPU. If a problem not completed in a given slot then that process will be reenter as per the FCFS, on rotation basis? Apply the scheduling on this?
3. Implement Non Preemptive Priority CPU Scheduling.
4. Implement Non Preemptive Shortest Job first CPU Scheduling.
5. If there are 5 different resources like 3 printer, 2 scanner are connected to a system each taking different time to complete the task. Which scheduling is best and gives best performance of CPU?
6. Implement the scheduling for that where CPU give chance to complete those process first which comes first?
7. Implement Round-Robin CPU scheduling.
8. Write a program to implement Semaphore.
9. Find the solution for the situation where 5 faculties are sitting in a round table. There are 4 ball pens are placed on this table. At a time only one pen can be picked by one faculty to writing work. What will happen if all picked the pen for writing simultaneously?
10. Find the solution for dentist checkup clinic where only one chair and one dentist is available for treatment. And having n chairs to waiting for patient.
 - If there is no patient, then the doctor sleeps in his own chair.
 - When a patient arrives, he has to wake up the doctor.
 - If there are many patients and the doctor is doing treatment of him, then the remaining patients either wait if there are empty chairs in the waiting room or they leave if no chairs are empty.
11. Write a program for Memory Management Algorithms e.g. First Fit, Best Fit, Worst Fit.
12. Demonstrate Virtual memory Techniques like, LRU, FIFO etc.
13. Implement Shortest Seek Time First Disk Scheduling Algorithm.
14. Implement Scan Scheduling Disk Scheduling Algorithm.
15. Implement Circular Scan Disk Scheduling Algorithm.
16. Implement Look Disk Scheduling Algorithm.

S.4 Database Management Systems (BTCS-405)

UNIT I

Introduction:

Concept & Overview of DBMS, Purpose of Database Systems, Architecture of DBMS, Data Models and its type, Schema and Instances, Data Independence, DBA and its function.

Entity-Relationship Model:

Entities, Attributes and its types, Mapping Cardinalities, Keys, Entity Relationship Diagram, Weak entity set and Strong entity set and Extended E-R features (Generalization , Specialization, Aggregation) ,ER Diagram to Relational Table conversion.

UNIT-II

Relational Model:

Structure of Relational Databases, Relation , Characteristics of Relations, Domains, Tuples , Relational schema and instance, Relational Algebra, Relational Algebra Operations (select, project, join and its type, union, intersection, set difference, Cartesian product, rename, division), Extended Relational Algebra Operations (Generalized Projection , Aggregate Functions , Outer Join),

Relational Calculus:

types of relational calculus, tuple and domain oriented relational calculus, and its operation.

UNIT-III

Integrity Constraints:

Null Values, Domain Constraints, Entity Integrity Constraints Referential Integrity Constraints, Key constraints, Triggers.

Relational Database Design:

Functional Dependency, Inference rule, Different Anomalies in designing a Database. Normalization , Decomposition, Normal Forms (1NF, 2NF, 3NF, BoyceCodd Normal Form, Normalization using Multi-Valued Dependencies, 4NF, Join Dependency, 5NF), Canonical cover.

UNIT IV

Query Optimization:

Introduction, steps of optimization, various algorithms to implement select, project and join operations of relational algebra, optimization methods: heuristic based, cost estimation based.

Transaction Processing, Concurrency Control and Recovery Management:

Transaction Model properties, State Serializability, Lock base protocols, Two Phase Locking, Time Stamping Protocols for Concurrency Control, and Validation Based Protocol, Multiple Granularities, Granularity of Data Item. Multi version schemes, Recovery with Concurrent Transaction, Recovery technique based on Deferred Update and Immediate Update, Shadow Paging, Recovery in Multi Database System and Database Backup and Recovery from Catastrophic Failure.

UNIT V

Index structures:

Types of index (primary, secondary, clustering, partitioning, unique and non index), use and Purpose of index, searching via an index.

SQL: DDL, DML, DQL (column function and grouping, union, multiple queries, union all, sub-query using IN, NOT IN, HAVING, GROUP BY CLAUSE), DCL (grant, revoke), TCL (Commit, roll back, save point, set Transaction)

Distributed database:

Planning for distributed database, management-centralized and decentralized Back-up and recovery.

Text books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.GrawHill, 6th Edition,2015.
2. C J Date, “An Introduction to Database System”, Pearson Educations, 8th Edition, 2004.
3. Elmasri, Navathe, “Fundamentals of Database Systems”, Pearson Educations 7th Edition, 2016.
4. SeemaKedar, Database Management System, Technical Publications, 2009. 5.
- 5.Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.

Reference Books:

1. IBM Career Education- database management system.
2. Abraham Silberschatz and S Sudarshan “Database System Concepts” 6th Edition McGraw-Hill Education – Europe 2013.
3. Raghu Ramakrishnan and Johannes Gehrke “Database Management Systems” McGrawHill Education, 2003.
4. Kahate, Atul “Introduction to Database Management Systems” Pearson Education India, 2006.

List of Practical:

1. Design a Database and create required tables. For e.g. Bank, College Database.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for table and record handling like implementing INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements and DROP, ALTER statements.
4. Write the queries for Retrieving Data from a Database Using the WHERE clause , Using Logical Operators in the WHERE clause , Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions and Combining Tables Using JOINS.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT () .
6. Write the query to implement the concept of Integrity constraints.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Display name, hire date of all employees using cursors.
10. Display details of first 5 highly paid employees using cursors.
11. Write a database trigger which fires if you try to insert, update, or delete after 7'o' clock.
12. Write a data base trigger, which acts just like primary key and does not allow duplicate values.
13. Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.
14. Write the query for creating the users and their role. Using GRANT and REVOKE operations

S.5 Advanced Java (BTCS-307)

UNIT I Introduction of Java Programming:

Java Networking :Network Basics and Socket overview, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, ServerSocket, InetAddress, URL, URL Connection.

UNIT II JDBC Programming:

JDBC Programming :The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQLException Class, The SQLWarning Class, The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management.

UNIT III SEVELET & API:

Servlet API and Overview : Servlet Model: Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor ServletContext and ServletConfig interface,

Attributes in Servlet, Request Dispatcher interface The Filter API: Filter, FilterChain, Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting .

UNIT IV Java Server Pages:

Java Server Pages : JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment ,JSP Directives, JSP Action, JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing

UNIT V Java Server Faces:

Java Server Faces2.0 : Introduction to JSF, JSF request processing Life cycle, JSF Expression Language, JSF Standard Component, JSF Facelets Tag, JSF Convertor Tag, JSF Validation Tag, JSF Event Handling and Database Access, JSF Libraries: PrimeFaces

Text Books:

1. Kathy walrath, Black Book Java server programming J2EE, 1st ed., Dream Tech Publishers, 2008.
2. James Keogh Complete Reference J2EE by Mcgraw publication 2016.
3. Subrahmanyam Allamaraju, Cedric Buest, Professional Java Server Programming by Wiley Publication 2011.
4. Matthew Scarpino, HanumantDeshmukh, JigneshMalavie SCWCD, Manning publication,2014.
5. Cay Horstmann and Gary Cornell Core Java, Volume II: Advanced Features Pearson Publication 2011.

Reference Books:

1. Kito D. Mann, Java Server Faces in Action, Manning Publication 2016.
2. Maydene Fisher, Jon Ellis, Jonathan Bruce JDBC™ API Tutorial and Reference, Third Edition, Addison Wesley ,2018 .
3. CookBook, Anghel Leonard, GiulioZambon Beginning JSP, JSF and Tomcat, Apress.JSF2.0, PACKT publication 2016.
4. Bryan Basham, Kathy Sierra & Bert Bates Head First Servlets and JSP, Publisher: O'Reilly Media 2015.

List of Practical:

1. Create chat application using either TCP or UDP protocol.
2. Implement TCP Server for transferring files using Socket and Server Socket
3. Implement any one sorting algorithm using TCP/UDP on Server application and Give Input On Client side and client should sorted output from server and display sorted on input side.
4. Implement Concurrent TCP Server programming in which more than one client can connect and communicate with Server for sending the string and server returns the reverse of string to each of client
5. Write RMI application where client supplies two numbers and server response by summing it. Provide your custom security policy for this application.
6. Implement Student information system using JDBC and RMI.
7. Create Servlet file which contains following functions:
 1. Connect

- 2. Create Database**
- 3. Create Table**
- 4. Insert Records into respective table**
- 5. Update records of particular table of database**
- 6. Delete Records from table.**
- 7. Delete table and also database.**

8. User can create a new database and also create new table under that database. Once database has been created then user can perform database operation by calling above functions.

Use following Java Statement interface to implement program:

- 1. Statement**
- 2. Prepared statement**
- 3. Callable statement.**

9. Create Servlet file and study web descriptor file. 10. Create login form and perform state management using Cookies, Http Session and URL Rewriting.

S.6 Application Development Using Python (BTIBM-403)

UNIT-I Introduction to Python

What is Python?, Advantages and disadvantages, Downloading and installing, Which version of Python Running Python Scripts and using the interpreter interactively.

UNIT-II Using variables, String types:

normal, raw and Unicode, String operators and expressions, Math operators and expressions, Writing to the screen, Reading from the keyboard and Indenting is significant.

UNIT-III

The if and elif statements, While Loops, Using List, Dictionaries, Using the for statement, Opening, reading and writing a text file, Using Pandas, the python data analysis library and data frames Grouping, aggregating and applying, merging and joining. Dealing with syntax errors, Exceptions, Handling exceptions with try/excep

UNIT-IV

RE Pattern Matching, Parsing Data, Introduction to Regression, Types of Regression, Use Cases, Exploratory data analysis, Correlation Matrix, Visualization using Metplotlib, Implementing linear regression

UNIT-V Machine Learning –

Algorithm, Algorithms – Random forest, Super vector Machine, Random Forest, Build your own model in python, Comparison between random forest and decision tree

TEXT BOOKS:

- 1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India**
- 2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.**
- 3. Mark Lutz "Learning Python" O'Reilly Media; 5 edition.**
- 4. David Beazley "Python Cookbook, Third edition" O'Reilly Media**

REFERENCES:

1. Python Essential Reference, 4th Edition Addison-Wesley Professional.
2. Mark Lutz "Programming Python: Powerful Object-Oriented Programming "David Beazley
"Python Cookbook" Third edition, O'Reilly Media

List of Practical:

1. Implement to use lists, tuples, and dictionaries in Python programs.
2. Implement to identify Python object types.
3. Implement to use indexing and slicing to access data in Python programs.
4. Implement structure and components of a Python program.
5. Implement to write loops and decision statements in Python.
6. Implement to write functions and pass arguments in Python.
7. Implement to build and package Python modules for reusability.
8. Implement to read and write files in Python.
9. Implement to design object-oriented programs with Python classes.
10. Implement data handling and use cases diagrams
11. Implement to use class inheritance in Python for reusability.
12. Implement to use exception handling in Python applications for error handling

S.7 Application Development and deployment using IOT (BTIBMC-701)

UNIT I

IoT Global LANDSCAPE:

What is the Internet of things, IoT global adoption, IoT common Patterns: sensor, data, analytics, IoT challenges: security and scalability, Resources.

UNIT III

IoT Solution Anatomy –

Device and Networks: IoT Solution Architecture, Physical Layer (Devices, Hardware, Sensors), Communication layer (IoT networks), Resources

Unit IV

IoT Solution Anatomy –

IoT Data Platform: IoT Platform Layer, Data Analytics and applications Layer, Resources

Unit V

Cognitive IoT Solutions-

IoT Sensor Data and AI, Data Science on the Cloud, Resources IoT Industry Case Studies: IoT Trends, IoT in Manufacturing, Global Logistics with IoT, Worker Safety, Industry Predictions, Resources

TEXT BOOKS:

1. Vijay Madisetti, Arshdeep Bahga," Internet of Things A Hands-On- Approach",2014, ISBN:978 0996025515

2. Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", John Wiley & Sons (2013), ISBN - 9781118430620
3. IBM Skills Academy

REFERENCES:

1. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700
2. Massimo Banzi, "Getting Started with Arduino", O'Reilly Media, Inc." (2011), ISBN9781449309879
3. Richard Grimmett, "Raspberry Pi Robotics Essentials", Packt Publishing Ltd (2015), ISBN-978178528564

LIST OF EXPERIMENTS:

1. Remote Sensor Data Visualization: Preface, Remote Sensors
2. IBM Cloud Account Creation and Device Setup: Preface, Obtain an IBM Cloud Account, Provision the Node-Red App, Register a new Device
3. Node-RED setup & Chart Data: Preface, Node-RED setup, Receive Environmental Sensor Data in Node-RED, Dashboard Charts – Plot Sensor Data
4. Store Data in Cloudant Storage & Chart Data: Preface, Import the Node-RED Cloudant storage flow, Chart Historical Sensor Data
5. Use IoT Sensor Data to track Zebras in Botswana with AI: Preface, Clone & Deploy, Create Services, Run the Application, Links
6. Analyze large Data Sets Collected from a Long-range IoT System: Preface, Create Services, and Run Watson Studio Notebook.

- Sem 5

S.1 Computer Graphics and Multimedia (BTCS-503)

UNIT I Introduction to Computer Graphics:-

What is Computer Graphics?, Where Computer Generated pictures are used, Elements of Pictures created in Computer Graphics Graphics display devices, Graphics input primitives and Devices. Introduction to OpenGL:- Getting started Making pictures, Drawing basic primitives Simple interaction with mouse and keyboard

UNIT II Points and Lines, AntialiasingLine Drawing Algorithm:-

DDA line drawing algorithm, parallel drawing algorithm Bresenham's drawing algorithm with example. Circle and Ellipse generating algorithms:- Mid-point Circle algorithm with example Mid-point Ellipse algorithm Mid-point Ellipse algorithm with example Parametric Cubic Curves:- Bezier curves B-Spline curves Filled Area Primitives:- Scan line polygon fill algorithm, Pattern fill algorithm Inside-Outside Tests, Boundary fill algorithms, Flood fill algorithms

UNIT III

2D Geometric Transformations -

Basic transformation, Matrix representation and Homogeneous Coordinates Composite transformation Other transformations. Transformation between coordinate systems. Window to Viewport coordinate transformation,

Clipping operations –

Point clipping, Line clipping:-Cohen – Sutherland line clippingLiang – Barsky line clippingMidpoint subdivision

Polygon Clipping-Sutherland –

Hodgeman polygon clippingWeiler – Atherton polygon clipping.3D object representation methods B-REP , sweep representations , CSG

Basic transformations-

Translation,Rotation, Scaling

Other transformations-

Reflection,Rotation about an arbitrary axis Composite transformations Projections – Parallel and Perspective 3D clipping

UNIT IV

3D Geometric Transformations and 3D Viewing Classification of Visible

Surface Detection algorithm:-

Translation,Rotation, Scaling

Other transformations:-

Reflection,Rotation about an arbitrary axis Composite transformations Projections,Back Surface detection method Depth Buffer method Scan line method BSP tree method, Area Subdivision method.

UNIT V Multimedia System:

An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards.i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP,MOV, MPEG , compression standards, compression through spatial and temporal redundancy. Multimedia Authoring .

TEXT BOOKS:

1. Sinha and Udai , "Computer Graphics", Tata McGraw Hill
2. Parekh "Principles of Multimedia" Tata McGraw Hill
3. Prabhat k Andleigh, KiranThakral , "Multimedia System Design " PHI Pub.
4. Donald Hearn and M.P. Becker "Computer Graphics" Pearson Pub.

REFERENCES:

1. Computer Graphics, C Version, 2e Paperback – 2002
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. David F Rogers, "Procedural elements for Computer Graphics", Tata McGraw Hill, Second Edition.
5. Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice in C", Second edition, Pearson Education.
6. David Hillmaa, "Multimedia Technology & Applications, Delmar, 1998.

LIST OF EXPERIMENTS:

1. Implement DDA Line Drawing algorithm

- 2. Implement Bresenham's line drawing algorithm.**
- 3. Implement Mid-Point circle drawing algorithm.**
- 4. Implement Mid-Point ellipse drawing algorithm.**
- 5. Implement cubic Bezier curve.**
- 6. Implement a menu-driven program for 2D transformations.**
- 7. Implement Line clipping algorithm using Cohen-Sutherland.**
- 8. Implement Polygon Clipping using Sutherland Hodgemam.**
- 9. Implement Scan line fill algorithm.**
- 10. Study of Multimedia and Program for Flash.**

S.2 Software Engineering and Project Management (BTCS-504)

UNIT-I Nature of Software:

Software Engineering, Software Process, A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models- Waterfall Model, Incremental Models, Evolutionary Models, Concurrent Models, Specialized Process Model, Unified Process, Personal and Team process Models, Process technology, Agile development.

UNIT-II Functional and Non-functional Requirements:

Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented Software Development, Use case Modeling, System and Software Requirement Specifications, Requirement Validation, Traceability.

UNIT-III The Software Design Process:

Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, SA/SD Component Based Design, Design Metrics.

UNIT-IV Software Testing Strategies-

Approach: Issues, Validation Testing and Their Criteria, System Testing, Alpha-Beta Testing, Debugging, Testing Conventional Applications, Testing Object Oriented Applications ,Testing Web Applications.

UNIT-V Need and Types of Maintenance:

Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance(SQA). Project Metrics.

Text Books:

- 1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Tata McGraw-Hill, Seventh edition, 2009.**
- 2. Richard Fairley, "Software Engineering Concepts" –, Tata Mcgraw Hill, 2008.**
- 3. Pankaj Jalote ,”An Integrated Approach to Software Engineering”, Narosa Pub, 2005.**
- 4. Richard H.Thayer,”Software Enginerring & Project Managements”,Willey India**

Reference:

1. Bernd Bruegge, Allen H. Dutoit, "Object-Oriented Software Engineering" Using UML, Patterns, and Java, PEARSON Third Edition, 2017.
2. Waman S.Jawadekar, "Software Engineering", TMH
3. Ian Sommerville, "Software Engineering", Seventh Edition, Pearson Education Asia, 2007.
4. Rajib Mall, "Fundamentals of Software Engineering" Second Edition, PHI Learning.

List of Practical: Select a topic of the project, and then make the report on following points

1. System Analysis
 - 1.1. Identification of Need
 - 1.2. Preliminary Investigation
2. Feasibility Study
 - 2.1. Technical Feasibility
 - 2.2. Economical Feasibility
 - 2.3. Operational Feasibility
3. Literature Survey
 - 3.1. Work done by other
 - 3.2. Benefits
 - 3.3. Proposed Solution
 - 3.4. Technology used
4. Software Engineering Approach
 - 4.1. Software Engineering paradigm Applied
 - 4.1.1. Description
 - 4.1.2. Advantage & Disadvantages
 - 4.1.3. Reasons for use
 - 4.2 Requirement Analysis
 - 4.2.1 Software Requirement Specification
 - 4.2.1.1 Glossary
 - 4.2.1.2 Supplementary Specifications
 - 4.2.1.3 Use Case Model
 - 4.2.1.4 Comparative analysis documents
 - 4.2.2 Conceptual Level Activity Diagram
 - 4.3 Planning Managerial Issues
 - 4.3.1 Planning Scope
 - 4.3.2 Project Resources
 - 4.3.3 Team Organization
 - 4.3.4 Project Scheduling
 - 4.3.5 Estimation
 - 4.3.6 Risk Analysis
 - 4.3.7 Security Plan
 - 4.4 Design
 - 4.4.1. Design Concept
 - 4.4.2. Design Technique
 - 4.4.3. Modeling
 - 4.4.3.1. ER Model

4.4.3.2. DFD Model

- 4.4.3.2.1. DFD Model Level-0 and 1**
- 4.4.3.2.2. DFD Model Level 2 and 3**
- 4.4.3.3. Data Dictionary**
- 4.4.3.4. Activity Diagram**
- 4.4.3.5. Software Architecture**

4.5 Implementation Phase

- 4.5.1. Language Used Characteristics**
- 4.5.2. Coding**

4.6 Testing

- 4.6.1. Testing Objectives**
- 4.6.2. Testing Methods & Strategies used along with test data and the error listed for each test case for each function provided by the system.**

S.3 Artificial Intelligence (BTCS-511)

UNIT-I Introduction:

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT-II Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search. **UNIT-III**

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networksrepresentation, construction and inference, temporal model, hidden Markov model.

UNIT-IV Markov Decision process:

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT-V Reinforcement Learning:

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd Edition, Prentice Hall.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill.
3. Trivedi, M.C., “A Classical Approach to Artifical Intelligence”, Khanna Publishing House, Delhi.
4. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011.
5. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010.

WEBSITES FOR REFERENCE:

1. <https://nptel.ac.in/courses/106105077>

2. <https://nptel.ac.in/courses/106106126>
3. <https://aima.cs.berkeley.edu>
4. https://ai.berkeley.edu/project_overview.html (for Practicals)

LIST OF PRACTICALS:

1. Write a programme to conduct uninformed and informed search.
2. Write a programme to conduct game search.
3. Write a programme to construct a Bayesian network from given data.
4. Write a programme to infer from the Bayesian network.
5. Write a programme to run value and policy iteration in a grid world.
6. Write a programme to do reinforcement learning in a grid world.
7. Mini Project work.

S.4 CYBER AND NETWORK SECURITY (BTIT-603)

UNIT-I

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security mechanism, Fundamental Security Design Principles, Attack Surface and Attack trees, A Model for Network Security. Introduction to Cyber crime, Cyber crime and Information Security, Classification of Cyber crimes, Cyber crime: The Legal Perspective, Cyber crime: An Indian Perspective.

UNIT-II

Introduction to Cyber offence, How Criminal plan the attack, Social Engineering, Cyber stalking, Cyber café and cyber crime, Botnets: The fuel of cybercrime, Attack vector, cloud computing. Cyber crime: Mobile and Wireless devices, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Setting for Mobile Devices, Authentication Service Security, Attack on Mobile Phones.

UNIT-III

Tools and Methods Used in Cyber crime, Proxy Server and Anonymizers, Phishing and Identity Theft, Password Cracking, Keylogger and Spyware, Virus and Worms, Trojan Horse and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attack on Wireless Networks.

UNIT-IV

Cyber crime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Information Technology Act, Digital Signature and the IT Act, Cybercrime and Punishment. Introduction to Cyber Forensics, Historical Background of Cyber Forensics, Cyber Forensics and Digital Evidence, Forensic Analysis of E-Mail, Digital Forensic Life Cycle, Approaching Computer Forensic Investigation, Relevance of OSI Model to Computer Forensic, Challenges in Computer Forensic.

UNIT-V

Network Access Control and Cloud Security, Transport- Level Security, Wireless Network Security, Electronic Mail Security, IP Security.

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", 7th Edition Pearson, 2017
2. Sunit Belapure, Nina Godbole "Cyber Security", 1st edition, Wiley Publication, 2011

REFERENCES:

1. Carl Endorf, Eugene Schultz, Jim Mellander "Intrusion Detection & Prevention", 1st Edition, TMH, 2007
2. Neal, Krawetz, Introduction to Network Security, 1st Edition, Cengage Learning, 2006
3. Atul Kahate, "Cryptography and Network Security", McGraw Hill, 2009
4. Charlie Kaufman, Radia Perlman, Mike Speciner, Michael Speciner, "Network Security - Private communication in a public world", 2nd Edition, TMH, 2002
5. Fouroz, "Cryptography & Network Security" 4th Edition, TMH, 2005
6. Mayank Bhushan "Fundamentals of Cyber Security", 1st Edition, BPB Publication, 2017
7. Gaurav Gupta, Sarika Gupta "Information Security and Cyber Laws", 1st Edition, Khanna Book Publishing, 2011.

LIST OF PRACTICALS: At least ten practical based on the syllabus.

S.5 WIRELESS COMMUNICATION NETWORKS (BTIT-511)

UNIT-I Introduction to Wireless Communication System:

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Second generation Cellular Networks, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL), Wireless Local Area network (WLAN),

UNIT-II The Cellular Concept- System Design Fundamentals:

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Cochannel and adjacent interference, Hand off Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization, Repeaters, Micro cell zone concept, Channel antenna system design considerations.

UNIT-III Mobile Radio Propagation Model, Small Scale Fading and diversity:

Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering, Link budget design, Max. Distance Coverage formula, Empirical formula for path loss, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread, Feher's delay spread, Types of small scale Fading, Rayleigh and rician distribution.

UNIT-IV Multiple Access Techniques:

Introduction, Comparisons of multiple Access Strategies TDMA, CDMA, FDMA, OFDM, CSMA Protocols. Mobile Network And Transport Layers :Mobile IP , Dynamic Host Configuration Protocol, Mobile Ad Hoc Routing Protocols, Multicast routing, TCP over Wireless Networks , Indirect TCP , Snooping TCP , Mobile TCP .Wireless Systems: GSM

system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, CDMA forward channels, CDMA reverse channels, Soft hand off, CDMA features, Power control in CDMA, Performance of CDMA System, GPRS system architecture.

UNIT-V

Introduction to Wi-Fi, WiMAX, Zig-Bee Networks, Software Defined Radio, UWB Radio, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network. Application Layer :WAP Model, Mobile Location based services ,WAP Gateway ,WAP protocols wireless bearers for WAP , WML ,WMLScripts.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education,
2. William Stallings, “Wireless Communications and Networks”, Pearson Education.
3. William D Stanley : Network Analysis with Applications, Pearson Education.
4. Roy Choudhary D: Network and systems, New Age Publication.
5. Wireless Communication, Theodore S. Rappaport, Prentice hall

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, First Edition, Pearson Education, 200UNIT III.
2. Uwe Hansmann,Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 200UNIT III.
3. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.
4. Wireless digital communication, Kamilo Feher, PH.

S.6 MANAGEMENT INFORMATION SYSTEM (BTIT-513)

UNIT-I Organizations and Computing:

Introduction, Modern Organization-IT enabled- NetworkedDispersed- Knowledge Organization, Information Systems in Organizations- what are information systems?, Brief history of computing- ENIAC: Way to commercial computers- Advent of artificial intelligence- advent of personal computing-Free Software Movement- Advent of Internet, The role of internet- Internet and Web: they are different-the internet changes everything

UNIT-II Managing Information Systems in Organizations:

Introduction, Managing in the Internet Era, Managing Information Systems in Organization- the IT interaction model, Challenges for the managerwhat information to build?-how much to spend on information systems?-what level of capabilities should be created with information systems?-how centralized should the services be?-what security levels are required?-what is technology road map for the organization?

UNIT-III Data and Information:

Introduction, data and information- measuring data, information as a resource, information in organizational functions, types of information technology, types of information systemstransaction processing systems-management information system.

UNIT-IV Decision making and communication:

Introduction, Decision making with MIS-Tactical decisionsoperational decisions-strategic decisions, communication in organizations- types of communicationexamples of communications in organizations- decision making with communication technology

UNIT-V Strategy:

Introduction, Information goods-properties-technology lock-in and switching costs-network externalities-positive feedback-tippy markets, information systems and competitive strategy-value chain, the Role of CIO-information system's plan-vendor coordination-technology updates-return on investment on technology.

TEXT BOOKS:

1. Kenneth C. Laudon& Jane P. Laudon, Essentials of Management Information Systems, Tenth Edition, Pearson Prentice, Hall, 2012
2. Terry Lucey, Management Information Systems, Ninth Edition, 2005, Thompson.

S.7 INFORMATION STORAGE AND MANAGEMENT (BTIT-611)

Unit-I: Introduction:

Digital data and its types, Information storage, Key characteristics of data center, Evolution of computing platforms. Introduction to storage technology: Data Proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

Unit-II: Storage System Architecture:

Intelligent disk subsystems overview, Contrast of integrands modular array, Component Architecture of Intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Unit-III: Introduction to network storage:

JBOD, DAS, NAS, SAN & CAS evolution and comparison, Applications, Elements, Connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN

Unit-IV: Hybrid storage solutions and virtualization:

memory, network, server, storage & appliances. Data centre concepts & requirements, Backup and disaster recovery. Industry Management standards, standard framework applications, Key management metrics.

Unit-V: Information storage on clouds:

concept of cloud, cloud computing, storage on cloud, Cloud benefits, Cloud computing evolution. Application & services on cloud, cloud service providers, cloud deployment models, Essential characteristics of cloud computing.

TEXT BOOK:

2. G.Somasundaram & Alok Shrivastava editors, ISM: Storing, Managing, and Protecting Digital Information; Wiley India

REFERENCES:

1. Saurabh; Cloud Computing : Insight into New era Infrastructure; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained: Basic and application of fiber channels, SAN, NAS, ISESI, INFINIBAND and FCOE, Wiley India.
3. Sosinsky, Cloud Computing Bible, Wiley India.

S.8 ENTERPRISE RESOURCE PLANNING (BTIT-712)

Unit I: Introduction to ERP

1. Enterprise Resource Planning –Introduction
2. Need of ERP
3. Advantages of ERP
4. Growth of ERP

Unit II: ERP and Related Technologies

1. Business process Reengineering (BPR)
2. Management Information System (MIS)
3. Decision Support Systems (DSS) Executive Support Systems (ESS)
4. Data Warehousing
5. Data Mining
6. Online Analytical Processing (OLTP)
7. Supply Chain Management (SCM)
8. Customer Relationship Management (CRM)

Unit III: Modules of ERP

1. ERP modules & Vendors Finance Production planning, control & maintenance Sales & Distribution Human Resource Management (HRM)
2. Inventory Control System.
3. Quality Management
4. ERP Market

Unit IV:

1. ERP Implementation
2. ERP Implementation Life Cycles Evaluation and selection of ERP package
3. Project planning Implementation
4. Team training & testing
5. End user training & Going Live
6. Post Evaluation & Maintenance.

Unit V: Post implementation of ERP

2. ERP Case Studies Post implementation review of ERP Packages in Manufacturing Services

REFERENCES:

1. Leon, A. (2008). Enterprise Resource Planning. New Delhi; Tata McGraw-Hil Education
2. Kumar, V., Venkitakrishna, N. K. (1998). ERP - Concepts and Practice. New Delhi; PHI
3. Garg, Venkitakrishnan (2003).ERP Concepts and Planning. New Delhi; PHI Learning.

S.9 Programming with Python (BTCS-407)

UNIT-I Introduction to Python:

The basic elements of Python, Branching programs, Strings and Input, Iteration. Functions, Scoping and Abstraction: Functions and Scoping, Specifications, Recursion, Global variables, Modules, Files.

UNIT-II Testing and Debugging:

Testing, Debugging. Structured Types, Mutability and Higher order Functions: Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries.

UNIT-III Exceptions and assertions:

Handling exceptions, Exceptions as a control flow mechanism, Assertions. Classes and Object oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and information hiding.

UNIT-IV Some simple Algorithms and Data Structures:

Search Algorithms, Sorting Algorithms, Hashtables. Plotting and more about Classes: Plotting using PyLab, Plotting mortgages and extended examples.

UNIT-V Dynamic Programming:

Fibonacci sequence revisited, Dynamic programming and the 0/1 Knapsack algorithm, Dynamic programming and divide and conquer.

TEXT BOOKS:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.
3. Mark Lutz "Learning Python" O'Reilly Media; 5 edition.
4. David Beazley "Python Cookbook, Third edition" O'Reilly Media

REFERENCES:

1. Python Essential Reference, 4th Edition Addison-Wesley Professional.
2. Mark Lutz "Programming Python: Powerful Object-Oriented Programming "David Beazley "Python Cookbook" Third edition, O'Reilly Media

LIST OF EXPERIMENTS:

1. Write a Python Program to Print Hello world!

- 2. Write a Program to Add Two Numbers.**
- 3. Write a Program to Find the Square Root.**
- 4. Write a Program to Calculate the Area of a Triangle.**
- 5. Write a Program to Solve Quadratic Equation.**
- 6. Write a Program to Swap Two Variables.**
- 7. Write a Program to Generate a Random Number.**
- 8. Write a Program to Convert Kilometers to Miles.**
- 9. Write a Program to Convert Celsius To Fahrenheit.**
- 10. Write a Program to check if a number is positive, negative or zero.**
- 11. Write a Program to Check if a Number is Odd or Even.**
- 12. Write a Program to Check Leap Year.**
- 13. Write a Program to Find the Largest Among Three Numbers.**
- 14. Write a Program to Check Prime Number.**
- 15. Write a Program to Print all Prime Numbers in an Interval.**
- 16. Write a Program to Find the Factorial of a Number.**
- 17. Write a Program to Display the multiplication Table.**
- 18. Write a Program to Print the Fibonacci sequence.**
- 19. Write an English sentence with understandable semantics but incorrect syntax. Write another English sentence which has correct syntax but has semantic errors.**
- 20. Create a program that prompts the user for a number of gallons of gasoline. Reprint that value along with its conversion equivalent number of liters.**
- 21. Write a program that allows a user to enter his or her two favorite foods. The program should then print out the name of a new food by joining the original food names together.**
- 22. Write a Tipper program where the user enters a restaurant bill total. The program should then display two amounts: a 15 percent tip and a 20 percent tip.**
- 23. Write a Car Salesman program where the user enters the base price of a car. The program should add on a bunch of extra fees such as tax, license, dealer prep, and destination charge. Make tax and license a percent of the base price. The other fees should be set values. Display the actual price of the car once all the extras are applied.**
- 24. Create a program with a function that calculates the area of a circle by taking a radius from the user.**
- 25. Write your own sum function called mySum that takes a list as a parameter and returns the accumulated sum.**

S.10 Scripting Languages (BTCS-607)

UNIT-I

Introduction of scripting languages, need of scripting, characteristics of scripting languages, uses of scripting languages, Introduction of client side scripting languages like JavaScript, VBScript, HTML5 (Structure), CSS3 (Designing), AJAX, jQuery, Server side scripting languages like PHP, ASP.NET (C# OR Visual Basic), C++, Java and JSP, Python, Ruby on Rails.

UNIT-II

PHP basic features, Embedding php code in your web pages, outputting the data to the browser, data types, variables, constants, expressions, string interpolation, control structure, function, creating a function, function library, Arrays, String & regular expression, Web forms, Files, Authentication, Uploading file with PHP, sending email using PHP.

UNIT-III

Python: Introduction to python languages, python syntax, statements, functions, build-in functions, methods, module in python, exception handling, integrated web application in python- Building small, efficient python web system, web application framework.

UNIT-IV

Introduction to Perl and scripting, scripts, programs, Web scripting and PERL names , values, variable, scalar expression, control structures, arrays, list, hashes, strings, patterns, and regular expression, subroutine.

UNIT-V

Introduction of Angular JS, Industrial usage of angular JS.benefits of Angular JS, Creation of Web application project using database, scripting, HTML, & CSS.

TEXT BOOKS:

1. **The World of Scripting Languages**, David Barron, Wiley Publications.
2. **Python Web Programming**, Steve Holden and David Beazley, New Riders Publications.
3. **Beginning PHP and MySQL**, 3" Edition, Jason Gilmore, Apress Publications (Dream tech.).

REFERENCES:

1. **Open Source Web Development with LAMP using Linux, Apache, MySQL, Pen and PHP**, J.Lee and B.Ware(Addison Wesley) Pearson Education.
2. **Programming Python**,M.Lutz,SPD.
3. **PHP 6 Fast and Easy Web Development**, Julie Meloni and Matt Telles, Cengage Learning Publications.
4. **PHP 5.1,l.Bayross and S.Shah**, The X Team, SPD.
5. **Core Python Programming**, Chun, Pearson Education.
6. **Guide to Programming with Python**, M.Dawson, Cengage Learning.
7. **Pen by Example**, E.Quigley, Pearson Education.
8. **Programming Perl**,Larry Wall, T.Christiansen and J.Orwant,O'Reilly, SPD.
9. **Tcl and the Tk Tool kit**, Ousterhout, Pearson Education.
10. **PHP and MySQL by Example**, E.Quigley, Prentice Hall(Pearson).
11. **Perl Power**, J.RFlynt, Cengage Learning.
12. **PHP Programming solutions**, V.Vaswani, TMH.

LIST OF EXPERIMENTS:

1. Javascript program to generate Fibonacci series and to look for motifs and patterns in sequences.
2. Javascript program to find out frequency of characters existing in nucleotide and protein sequences 6 Javascript's implementation to generate dynamic HTML pages.
3. Write PHP programs to do basic operations to deal with strings, and arrays, and to implement various mathematical functions.
4. Development of an PHP program to take set of sequences and find out conserved sequences.
5. Create a MySQL database tables and execute all SQL queries.
6. Write a PHP program to connect MySQL database and execute all SQL commands.

7. Construct a PHP interface for a given Web page and to produce its overall connectivity
8. Implement database and server site connectivity all together to generate complete dynamic web based applications through PHP, HTML and MySQL.
9. Write programs in Perl to implement string handling and other functions to be implemented to deal with biological data management.
10. Write PHP programs to do basic server side programming.

S.11 Big Data Technologies (BTIBMB-601)

Unit I:

Introduction to Big Data Traditional way of working in IT, Traditional IT Challenges, Future Trend in IT, What is Cloud Computing Cloud Characteristics, service and Delivery models, Cloud Computing helps overcome IT challenges, Traditional On-premises Core IT, Cloud Service, IBM Cloud – IAAS, PAAS and SAAS, IBM cloud Infrastructure (IaaS) Offerings, IBM Cloud Platform as a service offerings, Cloud Delivery models, Private Cloud, Public Cloud

Unit II:

Hadoop and HDFS The basic need for a big data strategy in terms of parallel reading of large data files and internode network speed in a cluster, Hadoop Distributed File System (HDFS), function of the Name Node and Data Nodes in an Hadoop cluster, files are stored and blocks ("splits") are replicated. Hive , Sqoop.

Unit III:

Introduction to Hortonworks and its components Apache Ambari- The purpose of Apache Ambari in the HDP stack, the overall architecture of Ambari and Ambari's relation to other services and components of a Hadoop cluster, the functions of the main components of Ambari, initiating start and stop services from Ambari Web Console. Overview about Hortonworks Data Platform - HDP -The functions and features of HDP, the IBM value-add components, what IBM Watson Studio is, a brief description of the purpose of each of the value-add components

Unit IV:

Data Processing and Management - MapReduce and YARN MapReduce model v1, the limitations of Hadoop 1 and MapReduce, review the Java code required to handle the Mapper class the, Reducer class and the program driver needed to access MapReduce, the YARN model, compare Hadoop 2/YARN with Hadoop 1.

Unit V:

Data Processing and Management- ZooKeeper, Slider, and Knox The challenges posed by distributed applications and how ZooKeeper is designed to handle them, the role of ZooKeeper within the Apache Hadoop infrastructure and the realm of Big Data management, the generic use cases and some real-world scenarios for ZooKeeper, the ZooKeeper services that are used to manage distributed systems, use the ZooKeeper CLI to interact with ZooKeeper services

TEXT BOOKS:

1. Introduction to Infosphere BigInsights, IBM Career Education
2. Changing Business with Data Insight, IBM Career Education
3. Big Insights Analytics for Business Analysts, IBM Career Education

REFERENCES:

- 1. Big Data: A Revolution That Will Transform How We Live, Work, and Think; Kenneth Cukier, Viktor Mayer-Schönberger; Mariner Books; Edition (2014)**
- 2. Big Data: Using Smart Big Data, Analytics and Metrics to Make Better; Bernard Marr; Wiley; Edition 1st (2015)**

LIST OF PRACTICALS:

- 1. Implement the following file management tasks in Hadoop: Adding files and directories**
 - Retrieving files**
 - Deleting files**

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
- 2. Install and Run Hive then use Hive to create, load, alter, and drop databases, tables.**
- 3. Implement Hive Partitioning with data set.**
- 4. Implement Hive bucketing with data set.**
- 5. Implement sqoop commands .**
- 6. Working on POC with data set.**
- 7. Implement Hbase commands with data set. and Explore Ambari.**
- 8. Install and Run Pig then write Pig Latin scripts to sort, group, join and filter your data.**
- 9. Explore Zookeeper.**
- 10.Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm with data set.**

S.12 Predictive Analytics (BTIBDA-501)

Unit 1 Introduction to Analytics with:

Use Cases Analytics Overview, Domains, Roles, Data Analytics in Practice, Methodologies, Methods, Integrated Environment for Analytics projects, Cloud Based Analytics Lifecycle, Analytics capabilities on the cloud.

Unit 2 Explore and Prepare Data:

Business Understanding, Explore Data, Prepare Data, Understanding Data, Statistics and Representation Techniques, Data Transformation, Represent and transform Unstructured Data, Data Transformation Tools.

Unit 3 Data Visualization and Presentation: Decision-centered visualization, Fundamentals of Visualization, Common graphs, Common tools.

Unit 4 Data Modeling and Machine Learning Algorithms:

Overview of modeling techniques, Machine Learning techniques, Accuracy Precision & recall, Model Deployment.

Unit 5 Machine Learning Algorithms:

About Machine Learning, From Regression to neural nets, Decision tree classifier, Machine learning Framework.

References:

1. <https://developer.ibm.com/articles/cc-beginner-guide-machine-learning-ai-cognitive/>
2. <http://bigdatauniversity.com/bdu-wp/> bdu-course/data-science-methodology
3. Wikipedia, “Cross Industry Standard Process for Data Mining,”
http://en.wikipedia.org/wiki/Cross_Industry_Standard_Process_for_Data_Mining,
<http://themodeling-agency.com/crisp-dm.pdf>
4. <https://www.ibm.com/blogs/business-analytics/descriptive-analytics-101-what-happened/>
5. <https://www.weforum.org/agenda/2015/02/a-brief-history-of-big-data-everyone-should-read/>
6. <https://medium.com/ibm-watson/introducing-ibm-watson-studio-e93638f0bb47>
7. <https://keyskill-clms.mylearnernportal.com/mod/lesson/view.php%3Fid=2808>
8. <https://www.ibm.com/design/language/experience/data-visualization/>

List of Practical:

1. Accessing IBM Cloud: Create an IBM account and Navigate to Catalog.
2. Implementing Data Assets from files from your local system, including structured, unstructured data and Images
3. Implementing Data Cleaning, analyzing and reshaping of data.
4. Visualize preliminary data wrangling result.
5. Implement below hypothesis
 - Hypothesis1: Loss Claim After Expired Policy
 - Hypothesis2: Loss Claim After Expired License
 - Hypothesis3: Excessive (Over \$10,000) Claim Amount
6. Hands on to implement Data Refinery Visualization using Claim Datasets
7. Hands on Lab for building and deploy models using AutoAI.
8. Hands on Lab of Auto Insurance Fraud Analyzed using Jupyter Notebook.
9. Hands on Lab to Analyze Bank Datasets and Hands on Hidden Facebook Usage.
10. Implementing Prediction of wildfire Intensity.

S.13 Micro services Architecture and Implementation (BTIBM-601)

UNIT I Introduction to Micro services:

Motivation for Micro services, What is monolithic application? Domain Driven Design, Edge Service, Dealing with complexity, Micro services Security, API management and gateways, the future of Micro services, Micro services Governance, Summary of Micro services.

UNIT II Web App development using NodeJs:

Introduction to NodeJs, Getting Started with NodeJs, Project Structure, Basic Routing, File system, View templates Serving static content, Handling HTTP and HTTPS, Connecting to database, Mongo DB Installation and Database, Node Js Mongo driver, Performing CRUD operations, Connecting Pooling, Connecting Pooling using NodeJS mongo driver, Performing CRUD operations, Connecting Pooling, Connecting Pooling using NodeJS mongo driver.

UNIT III Containers and Dockers:

Containers and Dockers, Basic Docker commands, Dev versus Ops, The Twelve-Factor App, Docker mission, Docker Adoption, Docker basic concept, Docker architecture, Docker typical workflow, Docker shared and layered file systems technology, container ecosystem and orchestration.

Unit IV Kubernetes:

what is kubernetes strength and architecture, Master & worker node component, kubernetes building blocks, Deploying Applications on kubernetes, Helm, Application center components, PoD health checking, Health check and kubectl example, Cloud application component architecture, Benefits of using Kubernetes with IBM container.

Unit V: Case Study:

The Journey from Monolith Architecture to Micro services; Refactoring A Monolith application Into A Cloud-Native App.

TEXT BOOKS:

1. IBM Career Education – “Microservices Architecture and Implementation”
2. Sam Newman, “Building Microservices”, O’reilly Publication.

REFERENCES:

1. NodeJS: <https://nodejs.org/documentation/>
2. Express: <http://express.com/4x/api/html>
3. MOngoDB: <http://docs.mongodb.org/manual/contents/>
4. Microservices: https://www.tutorialspoint.com/microservice_architecture/index.htm
5. Deploy a microservices app on IBM Cloud by using Kubernetes:
<https://www.ibm.com/cloud/garage/tutorials/microservices-app-on-kubernetes/>

LIST OF EXPERIMENTS:

1. Study of Docker components- Docker image, Docker container, Docker hub and Docker engine.
2. Installation of Docker on windows OS.
3. Study and perform basic Docker commands.
4. Creating a Docker Image.
5. Pushing the Image to a Repository(Docker Hub).
6. Deploying the Image to a Docker host.
7. Study of Kubernetes architecture.
8. Deploying application on Kubernetes

S.14 Predictive Modelling (BTIBMA-501)

Unit 1-

Define Data Analytics with real time uses Introduction of Analytics, Different Job role in analytics, Data Analytics in Practice, Methods of Analytics Process, Integrated Environment for Analytics projects, Lifecycle of Cloud Based Analytics.

Unit 2-

Data Preparation Phases of Data analytics: Business Understanding, Data Exploring & Preparation, Different tools of Statistics, Tools for Data Transformation, Visualization Methods & types of Data. CRISP-DM, KDD.

Unit 3-

Visualization and Presentation of Data: Decision-centered visualization, Fundamentals of Visualization, Different Types of Graphs like Bar, scatter, box plot, histogram, Pie chart, Common tools of visualization and representation of data.

Unit 4 –

Model Deployment Introduction of different techniques of modeling and Machine Learning, Confusion Matrix: Accuracy, Precision & Recall. Model Selection and Deployment.

Unit 5 –

Deep Dive into ML Introduction of Machine Learning, Types of learning: Supervised, Unsupervised & Reinforcement Learning, Types of Regression like Linear & Logistics, Neural Networks, Decision Tree Classifier, XGB Classifier, Different Frameworks of Machine Learning.

References:

1. <https://developer.ibm.com/articles/cc-beginner-guide-machine-learning-ai-cognitive/>
2. <http://bigdatauniversity.com/bdu-wp/> bdu-course/data-science-methodology
3. Wikipedia, “Cross Industry Standard Process for Data Mining,” http://en.wikipedia.org/wiki/Cross_Industry_Standard_Process_for_Data_Mining, <http://themodeling-agency.com/crisp-dm.pdf>
4. <https://www.ibm.com/blogs/business-analytics/descriptive-analytics-101-what-happened/>
5. <https://www.weforum.org/agenda/2015/02/a-brief-history-of-big-data-everyone-should-read/>
6. <https://medium.com/ibm-watson/introducing-ibm-watson-studio-e93638f0bb47>
7. <https://keyskill-clms.mylearnerportal.com/mod/lesson/view.php%3Fid=2808>
8. <https://www.ibm.com/design/language/experience/data-visualization/>

List of Practical:

Lab 1: IBM Cloud and Watson Studio

Lab 2: Explore and Understand Data: Implementing Data Assets from files.

Lab 3: Data Preparation by cleaning Data, analyzing and Conversion of data.

Lab 4: Visualize data on Watson studio.

Lab 5: Implement below hypothesis

- Hypothesis1: Loss Claim After Expired Policy
- Hypothesis2: Loss Claim After Expired License
- Hypothesis3: Excessive (Over \$10,000) Claim Amount

Lab 6: Building and Deploying Models with AutoAI.

Lab 7: Auto Insurance Fraud Analyzed in Jupyter Notebooks.

Lab 8: Predicting Insurance Fraud using Images.

Lab 9: Hands on Lab to Analyze Facebook Usage.

Lab 10: Hands on implementing Prediction of wildfire Intensity.

- Sem 6

S.1 Theory of Computation (BTCS-501)

UNIT-I Introduction:

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table,

Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

UNIT-II Regular Expression (RE):

Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT-III Context Free Grammar (CFG) and Context Free Languages (CFL):

Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT-IV Push Down Automata (PDA):

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT-V Turing machines (TM):

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to undecidability, undecidable problems about TM, NP hard and NP complete problem, Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

TEXT BOOKS:

1. Hopcroft and Ullman, —Introduction to Automata Theory, Languages and Computation, Pearson Education, 3rd edition, 2014
2. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Pub.House, 2011.
3. K.L.P Mishra & N.Chandrasekaran,—Theory of Computer Science, PHI Learning, 3rd edition, 2006

REFERENCES:

1. Martin J. C., —Introduction to Languages and Theory of Computations, TMH, 4th edition, 2010.
2. Papadimitriou, C. and Lewis, C. L., —Elements of the Theory of Computation, PHI, 1997.
3. Michael Sipser,—Introduction to Theory of Computation, Cengage Learning, 3rd edition, 2013.

S.2 Object Oriented Analysis and Design (BTIT-604)

UNIT-I Introduction:

About Object Oriented Technology, Development and OO Modeling History. Modeling Concepts: Modeling design Technique, Three models, Class Model, State model and Interaction model.

UNIT-II Class Modeling:

Object and class concepts, link and association, Generalization and Inheritance, Advanced class modeling- aggregation, Abstract class meta data, constraints. State Modeling: Event, state, Transition and conditions, state diagram, state diagram behavior, concurrency, Relation of Class and State models. Interaction Modeling: Use case Models, sequence models, activity models

UNIT-III Analysis and Design:

Development Life cycle, Development stages, Domain Analysis-Domain class model, domain state model, domain interaction model, Iterating and analysis. Application Interaction model, Application class model, Application state Model, Adding operation.

UNIT-IV System Design:

Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage, Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

UNIT-V Class design:

Overview of class design, designing algorithms recursing downward, refactoring, design optimization, Adjustment of Inheritance, Rectification of Behavior.

TEXT BOOKS:

1. Michael Blaha and J. Rumbugh, —Object oriented Modeling and design with UML®, Pearson Education

REFERENCES:

1. Satzinger, Jackson and Burd, —Object oriented Analysis and design with the Unified Process®, CENGAGE Learning.
2. O'Docherty, —Object Oriented Analysis and Design Understanding, System Development with UML2.0®, Wiley India.

LIST OF EXPERIMENTS

1. How to write a Problem Statement
2. Perform the system analysis: Requirement analysis, SRS.
3. Perform the function oriented diagram: DFD and Structured chart.
4. Perform the user's view analysis: Use case diagram.
5. Draw the structural view diagram: Class diagram, object diagram.
6. Draw the behavioral view diagram: Sequence diagram, Collaboration diagram.
7. Draw the behavioral view diagram: State-chart diagram, Activity diagram.
8. Draw the implementation view diagram: Component diagram.

9. Draw the environmental view diagram: Deployment diagram.

S.3 Simulation and Modeling (BTCS-612)

UNIT-I INTRODUCTION

Introduction to simulation & modeling, advantages and disadvantages of simulation, application areas in communication, computer and software design, systems and systems environment, components of a system, discrete and continuous systems, model of a system, types of models, discrete-event simulation, steps in a simulation study. Simulation Examples- Simulation of queueing systems, on-demand and inventory systems, simulation for reliability analysis, Introduction to GPSS.

UNIT-II COMPUTER BASED SYSTEM SIMULATION:

Types of System Simulation, Monte Carlo Method, comparison of analytical and Simulation methods, Markov Model, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

UNIT III INTRODUCTION TO QUEUING THEORY

Characteristics of queuing system, Poisson's formula, birth-death system, equilibrium of queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system, FSM, Petri-net Model.

UNIT-IV VERIFICATION AND VALIDATION

Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions , Validating Input & Output Transformations, Design of simulation experiments,

UNIT-V SIMULATION TOOLS Simulation Tools –

Model Input – High level computer system simulation – CPU – Memory, Simulation – Comparison of systems via simulation – Simulation Programming techniques, Development of Simulation models, General Purpose Simulation Package-MATLAB, ARENA, EXTEND, Study of SIMULA, DYNAMO

TEXT BOOKS:

- 1 Gordon G., System simulation, PHI Learning
- 2.Singh V.P System Simulation and Modeling NEW AGE INTERNATIONAL, PUBLISHERS
- 3.Taha H, Operations Research; PHI.
- 4.Payer, T., Introduction to system simulation, McGraw Hill.
- 5.Spriet JA; Computer Aided Modeling and Simulation, Academic Press INC; USA

REFERENCES:

1. J K Sharma, Operations Research Theory and Application, Pearson Education Pvt Ltd, 2 Edition Banks J; Hand book of Simulation; John Wiley.
- 2.Law AM and Kelton WD; Simulation Modeling and Analysis; TMH

LIST OF EXPERIMENTS:

1. Simulate CPU scheduling algorithm using queueing system.
2. Simulate multiplexer using queueing system.
3. Simulate Network congestion control algorithms using Petri-net Model.
4. Simulate disk scheduling algorithms Petri-net Model.
5. Verification and validation of Petri-net Model.
6. Simulate a Manufacturing shop and write a program in GPSS.
7. Simulate Telephone system model and write a program in SIMSCRIPT.
8. Graphical Simulation and Modeling using MATLAB.
9. Study of SIMULA.
10. Study of DYNAMO.

S.4 Software Testing and Quality Assurance (BTCS-613)

UNIT-I BASIC CONCEPTS:

Basic Testing Vocabulary, Quality Assurance versus Quality Control, The Cost of Quality, Software Quality Factors, Software Defect, The Multiple Roles of the Software Tester(People Relationships), Scope of Testing, Testing Constraints, Various software development Life cycles (SDLC), Independent Testing, QA Process, Levels of Testing, The —VII Concept of Testing.

UNIT-II WHITE BOX TESTING:

White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis.

UNIT-III BLACK BOX TESTING:

Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning -Syntax testing - Finite state testing - Levels of testing – Unit testing- Integration Testing

UNIT-IV SYSTEM TESTING –

Functional testing-non-Functional testing-acceptancetestingperformance testing –Factors and Methodology for Performance testing, Regression testingMethodology for Regression-testing.Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, Quality Characteristics, Software Quality Standard

UNIT-V ADVANCE SOFTWARE TESTING METHOD (OBJECT ORIENTED TESTING):

Syntax testing - Finite State testing - Levels of testing - Unit, Integration and System Testing. Challenges - Differences from testing non-OO Software - Class testing strategies - State-based Testing Software quality Assurance: ISO 9000; CMM and Test Management Issues; Quality Assurance personnel Issues.

TEXT BOOKS:

1. Kshirasagar Naik& Priyadarshi Tripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,„Software Engineering: A Practitioner's Approach“, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar, „Software Enginerring“, TMH
4. Sommerville, „Software Enginerring“, Pearson Education.

5.—IBM CE-Enablement Program- Essentials of Software Engineering (OOAD & SW Lifecycle)॥, IBM Career Education

REFERENCES:

1. Kshirasagar Naik& Priyadarshi Tripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman , Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar, Software Enginerring, TMH
4. Sommerville, Software Enginerring, Pearson Education.
5. <http://www.softwaretestinghelp.com/online-software-testing-course-syllabus/>
6. <https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/1217201473127725.pdf>
7. <http://www.tutorialspoint.com/uml/>

LIST OF EXPERIMENTS:

1. Design test cases using Boundary value analysis by taking quadratic equation problem.
2. Design test cases using Equivalence class partitioning taking triangle problem.
3. Design test cases using Decision table taking triangle problem.
4. Design independent paths by calculating cyclometer complexity using date problem.
5. Design independent paths by taking DD path using date problem.
6. Design the test cases for login page of AMIZONE.
7. Manual Testing for PAN card verification.
8. Generate test case for ATM machine.
9. Overview of Testing process using Rational Robot.
10. Write a script to record verification point using Rational Robot (For GUI testing of single click on window OS).
11. Write a script to record verification point for Clip Board and alphanumeric values using Rational Robot.

S.5 Robotics (BTCS-617)

UNIT—I Introduction to Robotics:

Types and components of a robot, Classification of robots, closedloop and open-loop control systems. Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT—II Robot Kinematics and Dynamics:

Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT—III Sensors and Vision System:

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity /Affine/Projective transformations. Vision applications in robotics.

UNIT—IV Robot Control:

Basics of control: Transfer functions, Control laws: P, PD, PID. Non-linear and advanced controls.

UNIT-V Robot Actuation Systems:

Actuators: Electric, Hydraulic and Pneumatic; **Transmission:** Gears, Timing Belts and Bearings, **Parameters for selection of actuators.**

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

TEXT BOOKS:

1. Saha, S.K., —Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., —Robotics, Oxford, New Delhi, 2006.
3. Niku Saeed B., —Introduction to Robotics: Analysis, Systems, Applications, PHI, New Delhi.
4. Mittal R.K. and Nagrath I.J., —Robotics and Control, Tata McGraw Hill.
5. Mukherjee S., —Robotics and Automation, Khanna Publishing House, Delhi.
6. Craig, J.J., —Introduction to Robotics: Mechanics and Control, Pearson, New Delhi, 2009
7. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, —Robot Modelling and Control, John Wiley and Sons Inc, 2005
8. Steve Heath, —Embedded System Design, 2nd Edition, Newnes, Burlington, 2003.
9. Merzouki R., Samantaray A.K., Phatak P.M. and Bouamama B. Ould, —Intelligent Mechatronic System: Modeling, Control and Diagnosis, Springer.

LIST OF PRACTICALS:

1. Study components of a real robot and its DH parameters.
2. Forward kinematics and validate using a software (Robo Analyser or any other free software tool).
3. Inverse kinematics of the real robot and validation using any software.
4. Use of open source computer vision programming tool openCV.
5. Image Processing using openCV.
6. Image Processing for color/shape detection.
7. Positioning and orientation of robot arm.
8. Control experiment using available hardware or software.
9. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
10. Project work

S.6 Block Chain (BTCS-618)

UNIT-I Introduction:

Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain. Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT-II Understanding Block chain with Crypto currency:

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. **Working with Consensus in Bitcoin:** Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT-III Understanding Block chain for Enterprises:

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT-IV Enterprise application of Block chain:

Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain.

UNIT-V Block chain application development:

Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

TEXT BOOKS:

1. Melanie Swan, —**Block Chain: Blueprint for a New Economy**®, O'Reilly, 2015
2. Josh Thompsons, —**Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming**®.
3. Daniel Drescher, —**Block Chain Basics**®, Apress; 1st edition, 2017.
4. Anshul Kaushik, —**Block Chain and Crypto Currencies**®, Khanna Publishing House, Delhi.
5. Imran Bashir, —**Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained**®, Packt Publishing.
6. Ritesh Modi, —**Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain**®, Packt Publishing.
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman. Ramakrishna, —**Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer**®, Import, 2018

LIST OF PRACTICALS:

2. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on Cloud to run.

<https://github.com/hyperledger/><https://docs.docker.com/getstarted/>https://console.ng.bluemix.net/docs/services/block_chain/index.html

https://console.bluemix.net/docs/containers/container_index.html#container_index

2. Create and deploy a block chain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chaincode, and perform invoke and query on your block chain network <https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-using-fabric-sdkjava/>

3. Interact with a block chain network. Execute transactions and requests against a block chain network by creating an app to test the network and its rules.

<https://developer.ibm.com/patterns/interacting-with-a-block-chain-network/>

4. Deploy an asset-transfer app using block chain. Learn app development within a Hyperledger Fabric network.

<https://developer.ibm.com/patterns/deploy-an-asset-transfer-app-using-block-chain/>

5. Use block chain to track fitness club rewards Build a web app that uses Hyperledger Fabric to track and trace member rewards.

<https://developer.ibm.com/patterns/fitness-club-rewards-points-iot-and-retail-integration/>

6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Block chain Starter Plan. Use Hyperledger Fabric to invoke chaincode while storing results and data in the starter plan.

<https://developer.ibm.com/patterns/car-auction-network-hyperledger-fabric-node-sdk-starterplan/>

7. Develop an IoT asset tracking app using Block chain. Use an IoT asset tracking device to improve a supply chain by using Block chain, IoT devices, and Node-RED.

<https://developer.ibm.com/patterns/develop-an-iot-asset-tracking-app-using-block-chain/>

8. Secure art using block chain digital certificates. Node.js-based auction application can help democratize the art market <https://developer.ibm.com/patterns/securing-art-using-block-chain-digital-certificates/>

9. Mini projects such as :

(i) Block chain for telecom roaming, fraud, and overage management. See how communication service providers use block chain to enhance their value chains.

<https://developer.ibm.com/patterns/blockchain-for-telecom-roaming-fraud-andoveragemanagement/>

(ii) Use IoT dashboards to analyze data sent from a Block chain network. Build an IoT app and IoT dashboards with Watson IoT Platform and Node-RED to analyze IoT data sent from a Block chain network. <https://developer.ibm.com/patterns/iot-dashboards-analyze-data-block-chain-network/>

(iii) Create an Android app with Block chain integration. Build a Block chain enabled health and fitness app with Android and Kubernetes.

<https://developer.ibm.com/patterns/create-an-android-app-with-block-chain-integration/>

(iv) Create a global finance block chain application with IBM Block chain Platform Extension for VS Code. Develop a Node.js smart contract and web app for a Global Finance with block chain use case <https://developer.ibm.com/patterns/global-financing-use-case-for-block-chain/>

(v) Develop a voting application using Hyperledger and Ethereum. Build a decentralized app that combines Ethereum's Web3 and Solidity smart contracts with Hyperledger's hosting Fabric and Chaincode EVM <https://developer.ibm.com/patterns/voting-app-hyperledger-ethereum/>

(vi) Create a block chain app for loyalty points with Hyperledger Fabric Ethereum Virtual Machine. Deploy Fabric locally with EVM and create a proxy for interacting with a smart contract through a Node.js web app <https://developer.ibm.com/patterns/loyalty-points-fabric-evm/>

UNIT-I css and JavaScript:

Understand JavaScript and DOM and BOM , Understand Server side Application, Understand NoSQL (MongoDb), Deployment of Nodejs application

UNIT-II Server side nodejs:-

Key features of NodeJS, Installation and Configuration, NodeJS Command Line, Sample Project using Node Express command prompt, Nodeclipse plugin, Sample Project using Nodeclipse, Performing CRUD Operations, Key features of MongoDB, Connection Pooling using NodeJS Mongo driver, Docker architecture, Virtual machines versus containers, about containers.

UNIT-III Docker:

A shipping container for code, Benefits of using containers, Docker basic concepts, Docker shared and layered file systems technology. Deployment of container, Learn the concept of kubernetes, Learn how to run Docker command, Understand pods and cluster Container ecosystem,

UNIT-IV

Kubernetes, Container, orchestration, Kubernetes architecture, Master Node Components, Worker Node Components, Kubernetes Building Blocks, Images, Immutability, Pod, Config Maps & Secrets, Deploying Applications on Kubernetes, Pod Health Checking, Kubectl Commands

UNIT-V

Cloud Application Component Architecture, Benefits of using Kubernetes with IBM Containers, About Microservices ,monolithic application, microservice security, api management and gateways, the future of microservices, microservices governance

TEXT BOOKS:

1. Sam Newman ,**Building Microservices**, O'Reilly Media
2. Ajay Sharma,—**Microservices Architecture**, Kindle Edition
3. IBM Career education **Microservices Architecture and Implementation**

REFERENCES:

1. Eberhard Wolff,—**Microservices — A Practical Guide**, Korean translation
2. Martin Kleppmann,—**Designing Data-Intensive Applications**, O'Reilly Media

Video Lectures

1. https://www.youtube.com/watch?v=dD2EISBDjWM&list=PLr6-GrHUIVf_ZNmuQSXdS197Oyr1L9sPB
2. <https://www.youtube.com/watch?v=0afZj1G0BIE&t=38s>
3. https://www.youtube.com/watch?v=Ukg_U3CnJWI&t=15s
4. https://www.youtube.com/watch?v=TIB_eWDSMt4
5. <https://www.youtube.com/watch?v=voDummz1gO0>
6. <https://www.youtube.com/watch?v=lktzQrHQcYU>

7. <https://www.youtube.com/watch?v=I4zWIW93-V4>

LIST OF EXPERIMENTS:

- 1 Design a static web application using html and CSS.**
- 2 Wap program to define variable ,control structure in JavaScript**
- 3 Define Function in JavaScript and understand message and link.**
- 4 Wap for window in JavaScript and its objects. Create a gauge report and a pie chart report**
- 5 Design application using nodejs and configure node-eclipse.**
- 6 Connectivity with mongo DB nodejs app**
- 7 Docker Commands**
 - a. Listing Running Containers**
 - b. Restarting Stopped Containers**
 - c. Retrieving Log Outputs**
 - d. Container Isolation**
 - e. Creating Docker Images**
 - f. Building a Dockerfile**
 - g. Copying Build Files**
- 8 Kuberntesss Cluster Demo**
- 9 VM Creation in Google Cloud Platform – Demo**
- 10 Minikube on local machine Shri Vaishnav Vidyapeeth Vish**

S.8 Big Data Engineering - Spark & Scala (BTIBMB-602)

UNIT-I

Introduction to Big Data and Analytics Introduction to big data, Big data overview, IBM 4'v, Describing the functions and features of HDP, Developing and understanding of the complete open-source Hadoop ecosystem, Understanding the purpose of Apache Ambari in the HDP stack, Exploring some of the directory structure on the Linux system, Describing the nature of the Hadoop Distributed File System (HDFS), Explaining the function of the NameNode and DataNodes in an Hadoop cluster, Explaining how files are stored and blocks ("splits") are replicated, Filing access and basic commands with HDFS, Describing the MapReduce model v1, Listing the limitations of Hadoop 1 and MapReduce 1, Mapper class and Reducer class, Describing the YARN model, Comparing Hadoop 2/YARN with Hadoop 1, Run MapReduce and YARN jobs, Understanding the overall architecture of Ambari, Listing the functions of the main components of Ambari, Explaining how to start and stop services from Ambari Web Console, Managing Hadoop clusters with Apache Ambari to Start the Apache Ambari web console, Sqoop Introduction, Sqoop commands processing, Zookeeper introduction

UNIT-II

Apache Spark and Scala Working with Spark RDD with Scala, Listing and describing the architecture and components of the Spark unified stack, Understanding the principles of Spark programming, Listing and describing the Spark libraries, Launching and using Spark's Scala and Python shells, Understanding the nature and purpose of Apache Spark in the Hadoop ecosystem, Listing and describing the architecture and components of the Spark unified stack, Describing the role of a Resilient Distributed Dataset (RDD), Understanding the principles of Spark programming, Listing and describing the Spark libraries, Launching and using Spark's Scala and Python shells

UNIT-III

Understanding Data Science and Notebooks Data Scientists overview, Recognizing the iterative nature of a data science project, Outlining the benefits of using Data Science Notebooks, Describing the mechanisms and tools used with Data Science Notebooks, Comparing and contrasting the major Notebooks used by Data Scientists, Data and notebooks in Jupyter, How notebooks help data scientists, Essential packages: NumPy, SciPy, Pandas, Scikit-learn, NLTK, BeautifulSoup, Data visualizations: matplotlib, PixieDust, Using Jupyter —Magic! commands, Start Jupyter - it will open in a web browser, Importing the lab, Exploring the component panels

UNIT-IV

BigSQL Overview of Big SQL, Understanding how Big SQL fits in the Hadoop architecture, Start and stop Big SQL using Ambari and command line, Connecting to Big SQL using command line, Connecting to Big SQL using IBM Data Server Manager, Starting Hadoop components, Executing basic Big SQL statements, Describing and creating Big SQL schemas and tables, Describing and listing the Big SQL data types, Working with various Big SQL DDLs, Loading data into Big SQL tables using best practices, Creating and dropping simple Big SQL table, Creating sample tables, Moving data into HDFS, Loading data into Big SQL tables, Creating and working with views, Creating external tables, Describing Big SQL supported file formats, Query Big SQL tables using various DMLs, Connecting to Big SQL, Query data with Big SQL, Working with the ARRAY type, Working with Big SQL functions, Storing data in an alternate file format (Parquet), Configuring the Big SQL Server, Configuring the Big SQL Scheduler, Backup and restore Big SQL, Configuring authentication for Big SQL, Managing security with Apache Ranger, Enabling SSL encryption, Configuring authorization of Big SQL objects, Configuring impersonation in Big SQL, Listing the supported data sources, Configuring Fluid Query with Big SQL

UNIT-V

Watson Studio Setting up a project, Working with collaborators, Managing data assets, Sign up for a Watson Studio account, Creating a new project, Managing a project, Adding collaborators, Loading data Managing the object storage, Overview of Jupyter notebooks, Creating notebooks, Coding and running notebooks, Sharing and publishing notebooks, Creating a notebook, Using notebooks, Working with external data.

TEXT BOOKS:

1. DT Editorial Services, —Big Data Black Book!, 2016
2. Subhashini Chellappan & Seema Acharya, —Big Data Analytics!, 2019
3. Radha Shankarmani & M. Vijaylakshmi, || Big Data Analytics!, 2016
4. Vibrant Publishers —Hadoop Big Data!, 2017

REFERENCES:

1. IBM Study Material
2. IBM Ebook

LIST OF EXPERIMENTS:

1. Steps to run vmware or cloudera
2. Processing of all hadoop commands on terminal

3. Working with hdfs storage and retrieval of data
4. Mapper class implementation using java
5. Reducer class implementation using java
6. Yarn implementation
7. Sqoop command processing
8. Spark implementation
9. Scala implementation
10. Ambari console and start and stop process
11. Jupyter notebook implementation
12. Working with ddl, dml, dql, tcl, dcl commands in big sql
13. Working with big sql views, array, functions like query
14. Creating Watson studio project
15. Working with Watson datasets, collaborators etc.

S.9 IT WorkshopSciLab/MATLAB (BTIT-608)

UNIT-I INTRODUCTION TO SIMULATION SOFTWARE:

About SCILAB/MATLAB, SCILAB/MATLAB System, Starting and Quitting

SCILAB/MATLAB. EXPRESSIONS: Variables Numbers, Operators Functions, Expressions.

UNIT-II FLOW CONTROL:

If, else, and else if, switch and case, for, while, continue, break try - catch, return. **COMMAND WINDOW: The format Function, Suppressing Output, Entering Long Statements, Command Line Editing.**

UNIT-III MATRICES AND ARRAYS:

Entering Matrices sum and transpose, subscripts, colon Operator, magic Function. **WORKING WITH MATRICES: Generating Matrices, The load Function, M-Files, Concatenation, Deleting Rows and Columns, Linear Algebra, Arrays Multivariate Data, Scalar Expansion, Logical Subscripting, find Function.**

UNIT-IV SCRIPTS & FUNCTIONS:

Scripts, Functions, Global Variables, Passing String Arguments to Functions, eval Function, Function Handles, Vectorization , Pre allocation. **OTHER DATA STRUCTURE: Multidimensional Arrays, Cell Arrays, Characters and Text, Structures**

UNIT-V GRAPHICS:

Plotting Process, Editing Process, Preparing Graphs, Basic Plotting Functions, Mesh & Surface Plot, and Image Reading & Writing, Printing graphics. **SIMULINK**

TEXT BOOKS & REFERENCES:

1. MATLAB and its Applications in Engineering, Rajkumar Bansal, Pearson Publishers, ISBN-10: 8131716813, 2009.
2. A Guide to MATLAB: For Beginners & Experienced Users By: Kevin R. Coombes, John E. Osborn, Garrett J. Stuck
3. SCILAB(a Free Software to Matlab),Er. HemaRamachandran and Dr. Achutsankar Nair, S. Chand Publishers, ISBN-10: 8121939704,2011

4. Introduction to SCILAB by Rachna Verma and Arvind Verma
5. SCILAB—A Beginner's Approach by Anil Kumar Verma
6. <http://in.mathworks.com/>
7. <https://www.scilab.org/resources/documentation/tutorials>

LIST OF PRACTICALS:

1. Addition, subtraction and multiplication of two matrices.
2. Verify whether the given matrix is singular or non-singular and compute its inverse if applicable.
3. Sorting of 1-D array and searching of an array/matrix. Also, list the set of numbers that obey a common condition in an array/matrix using `find()`.
4. Solve simultaneous equations (maximum of three) using Cramer's rule. [Simultaneous equations may be obtained by applying KCL or KVL for a circuit and they can be solved for voltages or currents, respectively]
5. a) Show that $\log_{10}(A \cdot B) = \log_{10} A + \log_{10} B$ and $\log_{10}(A/B) = \log_{10} A - \log_{10} B$
b) Plot the voltage across capacitor during charging $V_c = V_0[1 - e^{-(t/RC)}]$
6. a) Plot a straight line for the given slope and intercept using different plot attributes.
b) Differentiate and integrate $y = mx + c$, separately, and display the results on the same plot.
7. Plot $y_1 = A \cdot \sin(2\pi f_1 t)$, $y_2 = B \cdot \cos(2\pi f_2 t)$ and $y_3 = A \cdot \sin(2\pi f_1 t) + B \cdot \cos(2\pi f_2 t)$, in time and frequency (after computing DFT or FFT) domains as subplots and infer the results.
8. Integrate and differentiate $\sin(x)$ and display the results on the same plot in different colors. Also display $\sin(x)$ on the same plot.
9. Compute mean, median, standard deviation and variance of a set of data using formulae and verify using built-in functions.
10. Find all the even and prime numbers between two numbers (range).
11. Demonstrate
 - (a) reading and display image,
 - (b) converting color image to gray and black-and-white and plotting their histograms, and
 - (c) conversion of image file formats.
12. Compare the results of the built-in and user-defined function to compute $\cos(x)$ [the series $\cos(x) = 1 - (x^2 / 2!) + (x^4 / 4!) - (x^6 / 6!) + \dots$ can be used]
13. Write a program to compute roots of a quadratic equation $ax^2 + bx + c = 0$ given a , b and c .

S.10 Big Data Technologies (Hadoop) (BTIBMC-602)

UNIT I Introduction to Big Data:

Develop an understanding of the complete open-source Hadoop ecosystem and its near term future directions, compare and evaluate the major Hadoop distributions and their ecosystem components both their strengths and their limitations, hands-on experience with key components of various big data ecosystem components and roles in building a complete big data solution to common business problems.

UNIT II Hadoop and HDFS:

The basic need for a big data strategy in terms of parallel reading of large data files and internode network speed in a cluster, Hadoop Distributed File System (HDFS), function of the NameNode and DataNodes in a Hadoop cluster, files are stored and blocks ("splits") are replicated. Hive, Sqoop

UNIT III Introduction to Hortonworks and its components Apache Ambari:

The purpose of Apache Ambari in the HDP stack, the overall architecture of Ambari and Ambari' relation to other services and components of a Hadoop cluster, the functions of the main components of Ambari, initiating start and stop services from Ambari Web Console. Overview about Hortonworks Data Platform – HDP: The functions and features of HDP, the IBM value-add components, what IBM Watson Studio is, a brief description of the purpose of each of the value-add components

UNIT IV Data Processing and Management MapReduce and YARN:

MapReduce model v1, the limitations of Hadoop 1 and MapReduce, review the Java code required to handle the Mapper class, Reducer class and the program driver needed to access MapReduce, the YARN model, compare Hadoop 2/YARN with Hadoop 1

UNIT V ZooKeeper, Slider, and Knox:

The challenges posed by distributed applications and how ZooKeeper is designed to handle them, the role of ZooKeeper within the Apache Hadoop infrastructure and the realm of Big Data management, the generic use cases and some real-world scenarios for ZooKeeper, the ZooKeeper services that are used to manage distributed systems, use the ZooKeeper CLI to interact with ZooKeeper services

TEXT BOOKS:

1. Introduction to Infosphere BigInsights, IBM Career Education
2. Changing Business with Data Insight, IBM Career Education
3. Big Insights Analytics for Business Analysts, IBM Career Education
4. Tom White,|| Hadoop: The Definitive Guide Paperback – 2015|| Shroff Publishers & Distributors Private Limited - Mumbai; Fourth edition (2015).
5. V. K. Jain (Author),|| Big Data and Hadoop|| Khanna Publishers; 1 edition (1 June 2015)

REFERENCE BOOKS:

1. Big Data: A Revolution That Will Transform How We Live, Work, and Think; Kenneth Cukier, Viktor Mayer-Schönberger; Mariner Books; Edition (2014)
2. Big Data: Using Smart Big Data, Analytics and Metrics to Make Better; Bernard Marr; Wiley; Edition 1st (2015)
3. Hadoop For Dummies, Dirk deRoos, For Dummies, 2014
4. Cohen et al.—MAD Skills: New Analysis Practices for Big Data, 2009
5. Ullman, Rajaraman, Mining of Massive Datasets, Chapter 2
6. Stonebraker et al.,—MapReduce and Parallel DBMS's: Friends or Foes?, Communications of the ACM, January 2010.
7. Dean and Ghemawat, —MapReduce: A Flexible Data Processing Tool, Communications of the ACM, January 2010.

LIST OF PRACTICALS:

1. Installing Hadoop, configure HDFS, Install Zookeeper , Pig Installation, Sqoop Installation, Hbase Installation
2. Configuring Hadoop
3. Running jobs on Hadoop
4. Working on HDFS
5. Hadoop streaming
6. Creating Mapper function using python.
7. Creating Reducer function using python

8. Python iterator and generators
9.Twitter data sentimental analysis using Flume and Hive
10.Business insights of User usage records of data cards

11.Wiki page ranking with hadoop
12.Health care Data Management using Apache Hadoop ecosystem

S.11 Artificial Intelligence (BTIBMC-601)

UNIT-I:

AI LANDSCAPE AI impact in the world today, History and Evolution of AI, AI Explained, AI Technologies, Applications of A.I. Summary & Resources

UNIT-II: AI INDUSTRY ADOPTION APPROACHES AI Industry Impact, Autonomous Vehicles, SmartRobotics, Future Workforce and AI, Applications of AI. Main focus of AI, Summary & Resources.

UNIT-III: FUTURE TRENDS FOR AI Artificial Intelligence Trends, Limits of machine and human, AI predictions in the next 5 years Summary and Resources.

UNIT-IV:

MACHINE LEARNING AND DEEP LEARNING Machine Learning Explained, Various Algorithms of Machine Learning, Deep Learning Explained, Deep learning ecosystem, Experiments, Explain what neural networks are and why they are important in today's AI's field Explain what domain adaptation is and its applications Summary& Resources.

UNIT-V:

NATURAL LANGUAGE UNDERSTANDING AND COMPUTER VISION NLP Overview, NLP Explained, Virtual Agents Overview, Virtual Agents for the Enterprise, Summary and Resources, Computer Vision Overview, AI Vision through Deep Learning, Computer Vision for the Enterprise, Experiments. Summary and Resources **COMPUTER VISION** Define computer vision, History of computer vision Tools and Service of completed vision, Use cases of computer vision. Describe cognitive system, Summary and Resources.

TEXT BOOKS:

1. IBM TEXT BOOK

REFERENCES:

1. A Modern Approach by Norvig and Russell

LIST OF EXPERIMENTS:

- 1. SETTING UP YOUR CLOUD ACCOUNT**
 - Obtain an IBM cloud account
 - Apply promotion code
 - Uses the various services of IBM Cloud
- 2. CREATING A MODEL USING MACHINE LEARNING**

- Apply Algorithms
- Train the model
- Test The Model

3. CREATING AN AI VIRTUAL ASSISTANT

- Create a dialog skill
- Create a virtual assistant
- Load virtual assistant with various dialog skills
- Integrate your assistant

4. CREATE A CHATBOT USING PYTHON

- Use python Library
- Train the ChatBot
- Test The ChatBot

5. CREATE AN APPLICATIN USING OPEN CV

- Understand the Open CV Library
- Train The images and test

6.EDGE DETECTION CONCEPT

- Canny Algorithme
- How to detect the edges

7.BASIC UNDERSTANDING OF Tkinter,CREATE A GUI USING PYTHON

- Create an interface for the project
- Use the buttons and drop down
- Concept of Tokenization
- Concept of Lematization

S.12 Cloud Computing (BTCS-701)

UNIT-I:

Overview of Cloud Computing Introduction- Evolution, Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment, Advantages, Service & Deployment Models, Infrastructure, and Consumer View, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

UNIT-II :

Cloud Computing Technology Client systems, Networks, server systems and security from services perspectives, security and privacy issues; accessing the cloud with platforms and applications; Cloud storage

UNIT-III:

Working with Cloud Infrastructure as a Service – conceptual model and working, Platform as a Service – conceptual model and functionalities. Software as a Service –conceptual model and working. Trends in Service provisioning with clouds. Working on Microsoft Azure & IBM Smart Cloud.

UNIT-IV:

Using Cloud ServicesCloud collaborative applications and services – case studies with calendars, schedulers and event management; cloud applications in project management. Amazon Web Services & applications, AWS EC2, S3, Cloud Analytics, Cloud Open Stack

UNIT-V:

Case studies- Microsoft Azure, Google App Engine, IBM Smart Cloud and Open source clouds,- Open-Nebula, Sales force and Eucalyptus, Cloud Simulation

TEXT BOOKS:

1. **Cloud Computing: A Practical Approach** by Anthony T. Velte, Robert Elsenpeter, 2010 by The McGraw-Hill.
2. **Buyya, Selvi ,| Mastering Cloud Computing —,TMH Pub.**
3. **Michael Miller, Cloud computing – Web based Applications, Pearson Publishing, 2011**

REFERENCES:

1. **Kumar Saurabh, —Cloud Computing|, Wiley Pub,2012.**
2. **Krutz , Vines, —Cloud Security , Wiley Pub,2013.**
3. **Sosinsky, — Cloud Computing|, Wiley Pub,2012.**
4. **Murray Woodside; John Chinneck ; Marin Litiou on —Adaptive Cloud Deployment Using Persistence Strategies and Application Awareness|IEEEExplore, Year: 2017, Page(s):277 – 290.**

LIST OF EXPERIMENTS:

1. Service deployment & Usage over cloud using Virtual Box.
2. Performance evaluation of services over cloud using VMware tool.
3. Working of Goggle Drive to make spreadsheet.
4. Working on Heroku for Cloud application deployment.
5. Working on Aneka sevices for Cloud application.
6. Working on services of Google App Engine.
7. Working on Application deployment & services of Microsoft Azure.
8. Working on Application deployment & services of IBM Smart Cloud.
9. Working and configuration of Eucliptus.
10. Deployment & Services of Amazon Web Services.

S.13 Internet of Things (BTCS-602)

UNIT-I Introduction to IoT:

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology FundamentalsDevices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT-II Elements of IoT:

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT-III IoT Application Development:

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration.

UNIT-IV Device data storage:

Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT-V IoT Case Studies:

IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

TEXT BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, *Internet of Things, “A Hands on Approach”*, University Press.
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, *“Introduction to Internet of Things: A practical Approach”*, ETI Labs.
3. Pethuru Raj and Anupama C. Raman, *“The Internet of Things: Enabling Technologies, Platforms, and Use Cases”*, CRC Press
4. Jeeva Jose, *“Internet of Things”*, Khanna Publishing House, Delhi.
5. Adrian McEwen, *“Designing the Internet of Things”*, Wiley.
6. Raj Kamal, *“Internet of Things: Architecture and Design”*, McGraw Hill.
7. Cuno Pfister, *“Getting Started with the Internet of Things”*, O Reilly Media.

LIST OF PRACTICALS:

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/‘0’ is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.

15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

S.14 Data Science (BTCS-608)

UNIT-I Introduction to Data Science:

Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

UNIT-II Introduction to Programming Tools for Data Science:

Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

UNIT-III Mathematical Foundations:

Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference

UNIT-IV Machine Learning: Overview of Machine learning concepts –

Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time SeriesLinear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning And Generalization, Overview of Deep Learning.

UNIT-V Case Studies of Data Science Application:

Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOKS & REFERENCES:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
5. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
6. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press <http://www.deeplearningbook.org>
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

LIST OF PRACTICALS:

1. Write a programme in Python to predict the class of the flower based on available attributes.
2. Write a programme in Python to predict if a loan will get approved or not.
3. Write a programme in Python to predict the traffic on a new mode of transport.
4. Write a programme in Python to predict the class of user.
5. Write a programme in Python to indentify the tweets which are hate tweets and which are not.
6. Write a programme in Python to predict the age of the actors.
7. Mini project to predict the time taken to solve a problem given the current status of the user.

S.15 Minor Project (BTCS-606)

Objectives/Learning Outcomes/Capability Development

Program Learning Outcomes

This course contributes to the following program learning outcomes:

- **Enabling Knowledge:**

You will gain skills as you apply knowledge with creativity and initiative to new situations. In doing so, you will:

Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology

Recognize and use research principles and methods applicable to Information Technology.

- **Critical Analysis:**

You will learn to accurately and objectively examine, and critically investigate Information Technology (IT) concepts, evidence, theories or situations, in particular to:

analyze and model complex requirements and constraints for the purpose of designing and implementing software artifacts and IT systems

Evaluate and compare designs of software artifacts and IT systems on the basis of organizational and user requirements.

- **Problem Solving:** Your capability to analyze complex problems and provide suitable solutions will be extended as you learn to: design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification.

- **Communication:** You will learn to communicate effectively with a variety of audiences through a range of modes and media, in particular to: interpret abstract theoretical propositions, choose methodologies, justify conclusions and defend professional decisions to both IT and non-IT personnel via technical reports of professional standard and technical presentations.

- **Responsibility:** You will be required to accept responsibility for your own learning and make informed decisions about judging and adopting appropriate behaviour in professional and social situations. This includes accepting the responsibility for independent life-long learning and a high level of accountability. Specifically, you will learn to: effectively apply relevant standards, ethical considerations, and an understanding of legal and privacy issues to designing software applications and IT systems.

• **Research and Scholarship:** You will have technical and communication skills to design, evaluate, implement, analyze and theorize about developments that contribute to professional practice or scholarship; specifically you will have cognitive skills:

To demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice or scholarship

To plan and execute a substantial research-based project, capstone experience and/or piece of scholarship.

Course Learning Outcomes Upon successful completion of this course you should be able to:

- Identify a task or problem relevant to /or IT
- Search and review of the relevant literature
- Propose a solution to the task or problem
- Develop a software and/or algorithmic solution to the task or problem
- Implement solutions to meet high quality requirements developed by the supervisor
- Carry out research under supervision
- Present the research in a written form like that used for published papers
- Present the research in an oral seminar.

Overview of Learning Activities

A Minor project is a substantial work of supervised research or software development. You will choose an academic staff member as your supervisor to work on a research project. To successfully complete the course, you must demonstrate research skills: ability to undertake research under supervision, ability to analyze, develop, and present the research in a written form like that used for published papers, and ability to present the research in an oral seminar. In this course, you are expected to carry out research activities including implementing a complete solution to the problems identified by the supervisor, critical analysis of results, and completing a written Project. The major deadline for this course is the delivery of the Minor Project by the end of the semester.

Overview of Assessment

You must satisfactorily complete each of the following assessment tasks for this course:

Research project comprising an implemented and critically analyzed solution to the task or problem

Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area

Seminar on your research (of 20 minutes) soon after your Project is submitted.

The Minor Project is assessed on its merits as a research publication. Each Project is examined by two academics, usually from within the Institute.

- Sem 7

S.1 Human Values and Professional Ethics (BBAI-501)

Unit I: Human Value

1. Definition, Essence, Features and Sources
2. Sources and Classification
3. Hierarchy of Values

4. Values Across Culture

Unit II: Morality

- 1. Definition, Moral Behaviour and Systems**
- 2. Characteristics of Moral Standards**
- 3. Values Vs Ethics Vs Morality**
- 4. Impression Formation and Management**

Unit III: Leadership in Indian Ethical Perspective.

- 1. Leadership, Characteristics**
- 2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)**
- 3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).**

Unit IV: Human Behavior – Indian Thoughts

- 1. Business Ethics its meaning and definition**
- 2. Types, Objectives, Sources, Relevance in Business organisations.**
- 3. Theories of Ethics, Codes of Ethics**

Unit V: Globalization and Ethics

- 2. Sources of Indian Ethos & its impact on human behavior**
- 2. Corporate Citizenship and Social Responsibility – Concept (in Business),**
- 3. Work Ethics and factors affecting work Ethics.**

Suggested Readings

- 1. Beteille, Andre (1991). Society and Politics in India. AthlonePress:New Jersey.**
 - 2. Chakraborty, S. K. (1999). Values and Ethics for Organizations. oxford university press**
 - 3. Fernando, A.C. (2009). Business Ethics - An Indian Perspective .India: Pearson Education: India**
 - 4. Fleddermann, Charles D. (2012). Engineering Ethics. New Jersey: Pearson Education / Prentice Hall.**
 - 5. Boatright, John R (2012). Ethics and the Conduct of Business.Pearson. Education: New Delhi.**
 - 6. Crane, Andrew and Matten, Dirk (2015). Business Ethics. Oxford University Press Inc:New York.**
 - 7. Murthy, C.S.V. (2016). Business Ethics – Text and Cases. Himalaya Publishing House Pvt. Ltd:Mumbai**
 - 8. Naag Rajan, R.R (2016). Professional Ethics and Human Values. New Age International Publications:New Delhi.**
- S.2 Compiler Design (BTCS-601)**

Unit – I: Introduction:

Compiler, Compilers analysis of the source program, Phases of a compiler, Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens. Unit – II: Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

Unit – III: Intermediate Code Generation:

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

Unit – IV: Code Optimization and Run Time Environments:

Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

Unit – V: Code Generation:

Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

Text Books:

1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

References:

1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

List of Experiments:

1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.

7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.

S.3 OBJECT ORIENTED ANALYSIS AND DESIGN (BTIT-604)

UNIT-I Introduction:

About Object Oriented Technology, Development and OO Modeling History. Modeling Concepts: Modeling design Technique, Three models, Class Model, State model and Interaction model.

UNIT-II Class Modeling:

Object and class concepts, link and association, Generalization and Inheritance, Advanced class modeling- aggregation, Abstract class meta data, constraints. State Modeling: Event, state, Transition and conditions, state diagram, state diagram behavior, concurrency, Relation of Class and State models. Interaction Modeling: Use case Models, sequence models, activity models

UNIT-III Analysis and Design:

Development Life cycle, Development stages, Domain Analysis-Domain class model, domain state model, domain interaction model, Iterating and analysis. Application Interaction model, Application class model, Application state Model, Adding operation.

UNIT-IV System Design:

Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage, Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

UNIT-V Class design:

Overview of class design, designing algorithms recursing downward, refactoring, design optimization, Adjustment of Inheritance, Rectification of Behavior.

TEXT BOOKS:

S.2 Michael Blaha and J. Rumbugh, “Object oriented Modeling and design with UML”, Pearson Education

REFERENCES:

1. Satzinger, Jackson and Burd, “Object oriented Analysis and design with the Unified Process”, CENGAGE Learning.
2. O’Docherty, “Object Oriented Analysis and Design Understanding, System Development with UML2.0”, Wiley India.

LIST OF EXPERIMENTS

- 1. How to write a Problem Statement**
- 2. Perform the system analysis: Requirement analysis, SRS.**
- 3. Perform the function oriented diagram: DFD and Structured chart.**
- 4. Perform the user's view analysis: Use case diagram.**
- 5. Draw the structural view diagram: Class diagram, object diagram.**
- 6. Draw the behavioral view diagram: Sequence diagram, Collaboration diagram.**
- 7. Draw the behavioral view diagram: State-chart diagram, Activity diagram.**
- 8. Draw the implementation view diagram: Component diagram.**
- 9. Draw the environmental view diagram: Deployment diagram.**

S.4 BIG DATA AND HADOOP (BTCS-702)

UNIT I

Introduction about big data ,Describe details Big data: definition and taxonomy , explain Big data value for the enterprise , Setting up the demo environment ,Describe Hadoop Architecture , Hadoop Distributed File System, MapReduce& HDFS , First steps with the Hadoop , Deep to understand the fundamental of MapReduce

UNIT II –

Hadoop ecosystem, Installing Hadoop Eco System and Integrate With Hive Installation, PigInstallation, Hadoop , Zookeeper Installation , Hbase Installation , Sqoop Installation, Installing Mahout Introduction to Hadoop , Hadoop components: MapReduce/Pig/Hive/HBase, Loading data into Hadoop, Getting data from Hadoop.

UNIT III

Using Hadoop to store data, Learn NoSQL Data Management, Querying big data with Hive, Introduction to the SQL Language , From SQL to HiveQL , Querying big data with Hive, Introduction to HIVE e HIVEQL, Using Hive to query Hadoop files. Moving the Data from RDBMS to Hadoop, Moving the Data from RDBMS to Hbase , Moving the Data from RDBMS to Hive UNIT IV Machine Learning Libraries for big data analysis, Machine Learning Model Deployment, Machine learning tools , Spark & SparkML , H2O , Azure ML.

UNIT V

Monitoring The HadoopCluster , Monitoring Hadoop Cluster, Monitoring Hadoop Cluster with Nagios, Monitoring Hadoop Cluster, Real Time Example in Hadoop , Apache Log viewer Analysis , Market Basket AlgorithmsBig Data Analysis in Practice , Case Study , Preparation of Case Study Report and Presentation , Case Study Presentation

Text Books:

- 1. Tom White," Hadoop: The Definitive Guide Paperback – 2015" Shroff Publishers & Distributors Private Limited - Mumbai; Fourth edition (2015).**
- 2. V. K. Jain (Author)," Big Data and Hadoop" Khanna Publishers; 1 edition (1 June 2015)**
- 3. Jason Bell (Author) "Machine Learning for Big Data: Hands-On for Developers and Technical Professionals" Wiley (2014)**
- 4. Big Data Analytics &Hadoop by IBM ICE Publications**

References:

1. **Big data. Architettura, tecnologie e metodi per l'utilizzo di grandi basi di dati**, A. Rezzani, Apogeo Education, 2013
2. **Hadoop For Dummies**, Dirk deRoos, For Dummies, 2014
3. Cohen et al. "MAD Skills: New Analysis Practices for Big Data", 2009
4. Ullman, Rajaraman, Mining of Massive Datasets, Chapter 2
5. Stonebraker et al., "MapReduce and Parallel DBMS's: Friends or Foes?", Communications of the ACM, January 2010.
6. Dean and Ghemawat, "MapReduce: A Flexible Data Processing Tool", Communications of the ACM, January 2010.

List of Practical's:

1. **Installing Hadoop, configure HDFS, Install Zookeeper , Pig Installation, Sqoop Installation, Hbase Installation**
2. **Configuring Hadoop**
3. **Running jobs on Hadoop**
4. **Working on HDFS 5. Hadoop streaming**

S.5 Next Generation Telecommunication Networks (BTCC-703)

UNIT-I

Basic history of Mobile Computing Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing.

UNIT-II

Next Generation Networks (NGN), Principles and definition of an NGN, The NGN architecture, Outline of technology choices, Network and implementation issues with NGN, Numbering & Addressing

UNIT-III

Wireless n/w. and Technologies Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G, Bluetooth, Radio frequency identification(Rfid), Wireless Broadband, Mobile IP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. ,IPv6

UNIT-IV

Next Generation Core NetworkThe role of the core network, Enabling Control and Reconfigurability, Packet Switching (ATM, IP, MPLS, Ethernet), IP Multi-Media System (IMS), Principles of control for IP networks, Concept of IMS UNIT-V NGN Service AspectsServices on an NGN, Service compatibility with PSTN and IN, Use of APIs and service provider interfaces, Brief review of the principles of mobile networks, Relationship of mobile developments to NGN

TEXT BOOKS

1. VALDAR, A R: 'Understanding Telecommunications Networks', IET Telecommunications Series 52, 2006
2. Convergence Technologies for 3G Networks: IP, UMTS, EGPRS and ATM Authors: Jeffrey Bannister, Paul Mather, and Sebastian Cope. . John Wiley & Sons, Ltd. ISBN 0-470-86091-X (HB)
3. Mobile Computing , Asoke K Telukder, Roopa R Yavagal, TMH
4. Wireless Communications and Networks, 3G and beyond, ITI SahaMisra, TMH

REFERENCES

1. M Carugi "Introduction to the ITU-T NGN focus group release 1: target environment, services, and capabilities," Communications Magazine, IEEE, vol.43, no.10, pp. 42- 48, Oct. 2005
2. Chae-Sub Lee, Knight, D. ,"Realization of the next-generation network,"Communications Magazine, IEEE, vol.43, no.10, pp. 34- 41, Oct. 2005.

S.6 Soft computing (BTCS-711)

UNIT-I

Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems, Soft Computing and its Techniques, Soft Computing verses Hard Computing. Applications of Soft Computing in the Current industry.

UNIT-II

Introduction to Fuzzy Logic, Crisp Sets, Fuzzy Sets, Fuzzy Relations, Membership Functions and features, Fuzzification, Methods of Membership Value Assignments, Defuzzification and methods, Lambda cuts. Fuzzy Measure, Fuzzy Reasoning, Fuzzy Inference System.

UNIT-III

Neural Network (NN), Biological foundation of Neural Network, Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Netsand applications of Neural Network

UNIT-IV

Genetic Algorithm, Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

UNIT-V

Neuro-Fuzzy and Soft Computing, Adaptive Neuro-Fuzzy Inference System Architecture, Hybrid Learning Algorithm, Learning Methods thatCross-fertilize ANFIS and RBFN. Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. Hybridization of other techniques.

TEXT BOOKS

1. S.N. Deepa and S.N. Sivanandam, Principles of Soft Computing, 2ed., Wiley, 2011
2. Vojislav Kecman, Learning and Soft Computing - Support Vector Machines, Neural Networks, and Fuzzy Logic Models, 1ed., The MIT Press, 2001.
3. D. K. Pratihar, Soft Computing, 1ed., Alpha Science, 2007.
4. Timothy J. Ross, Fuzzy logic with Engineering Applications, 3ed., John Wiley and Sons, 2010.
5. S. Rajasekaran and G.A.V. Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, 2ed. PHI
6. David E. Goldberg, Genetic Algorithms in search, Optimization & Machine Learning, 1ed., Addison-Wesley Publishing Company, 1989

REFERENCES

1. Jang, Sun and Mizutani, Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, 1ed., Pearson, 1997.
 2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, 1ed., Prentice Hall, 1995
 3. Simon Haykin, Neural Networks: A Comprehensive Foundation, 2ed. Prentice Hall, 1998
 4. Samir Roy and Udit Chakraborty, A Beginner's Approach to Soft Computing, 1ed., Pearson, 2013
- S.7 Quantum Computing (BTCS-715)

UNIT-I Introduction to Quantum Computing:

Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing, Overview of major concepts in Quantum Computing: Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement.

UNIT-II Math Foundation for Quantum Computing:

Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT-III Building Blocks for Quantum Program:

Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Bloch Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perspective e.g. Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc, Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

UNIT-IV Quantum Algorithms:

Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks, Major Algorithms: Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm,

UNIT-V OSS Toolkits for implementing Quantum program:

IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)

TEXT BOOKS & REFERENCES:

1. Michael A. Nielsen, “Quantum Computation and Quantum Information”, Cambridge University Press.
2. David McMahon, “Quantum Computing Explained”, Wiley.
3. IBM Experience: <https://quantumexperience.ng.bluemix.net>
4. Microsoft Quantum Development Kit <https://www.microsoft.com/en-us/quantum/development-kit>
5. Forest SDK PyQuil: <https://pyquil.readthedocs.io/en/stable/>

S.8 Virtual Reality (BTCS-716)

UNIT-I Introduction to Virtual Reality:

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark. **3D Computer Graphics:** Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

UNIT-II Geometric Modelling:

Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation. **Geometrical Transformations:** Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection. **Generic VR system:** Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

UNIT-III Virtual Environment:

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system. **Physical Simulation:** Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT-IV VR Hardware and Software: Human factors:

Introduction, the eye, the ear, the somatic senses. **VR Hardware:** Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. **VR Software:** Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

UNIT-V VR Applications:

Introduction, Engineering, Entertainment, Science, Training. The Future: Virtual environment, modes of interaction

TEXT BOOKS & REFERENCES:

1. John Vince, “Virtual Reality Systems”, Pearson Education Asia, 2007.
2. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.
3. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.

4. Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Inter Science, 2nd Edition, 2006.
5. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application and Design”, Morgan Kaufmann, 2008.
6. www.vresources.org
7. www.vrac.iastate.edu
8. www.w3.org/MarkUp/VRM

S.9 Project (BTCS-706)

S.No	Particular
1.	Group formation and Submission of Project Topic (At least three(03))
2.	Guide allotment and Topic Finalization
3.	Presentation –I Contents: 1. Problem Domain 2. Literature Survey 3. Feasibility Study 4. References
4.	Synopsis Submission
5.	Presentation – II Contents: 1. SRS / URD 2. Conceptual Design
6.	Presentation – III Contents: 1. Detail Design 2. Implementation & Test Plan
7.	Project Report Submission

3) B.tech (ES-RH)

- Sem 1

S.1 Mathematics – (BTMACS-101)

UNIT I Differential Calculus:

Limits of functions, continuous functions, uniform continuity, monotone and inverse functions. Differentiable functions, Rolle's theorem, mean value theorems and Taylor's theorem, power series. Functions of several variables, partial derivatives, chain rule, Tangent planes and normals. Maxima, minima, saddle points, Lagrange multipliers, exact differentials

UNIT II Integral Calculus:

Riemann integration, fundamental theorem of integral calculus, improper integrals. Application to length, area, volume, surface area of revolution. Multiple integrals with application to volume, surface area, Change of variables.

UNIT III Numerical Analysis:

Number Representation and Errors: Numerical Errors; Floating Point Representation; Finite Single and Double Precision Differences; Machine Epsilon; Significant Digits. Numerical Methods for Solving Nonlinear Equations: Method of Bisection, Secant Method, False Position, Newton-Raphson's Method, Multidimensional Newton's Method, Fixed Point Method and their convergence.

UNIT IV Numerical Methods for Solving System of Linear Equations:

Norms; Condition Numbers, Forward Gaussian Elimination and Backward Substitution; Gauss-Jordan Elimination; FGE with Partial Pivoting and Row Scaling; LU Decomposition; Iterative Methods: Jacobi, Gauss Siedal; Power method and QR method for Eigen Value and Eigenvector.

UNIT V Vector Calculus:

Gradient and directional derivative. Divergence and Curl of Vector point function, line and surface integrals. Green“s, Gauss“ and Stokes“ theorems and their applications.

Text Books:

11. T. M. Apostol, **Calculus, Volume I**, 2nd Ed, Wiley, 1967.
12. T. M. Apostol, **Calculus, Volume II**, 2nd Ed, Wiley, 1969.
13. K. E. Atkinson, **Numerical Analysis**, John Wiley, Low Price Edition(2004).
14. S. D. Conte and C. de Boor, **Elementary Numerical Analysis - An Algorithmic Approach**, McGraw-Hill, 2005.
15. B. S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers, Delhi

Reference Books:

13. R. G. Bartle and D. R. Sherbert, **Introduction to Real Analysis**, 5th Ed, Wiley, 1999.
14. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
15. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
16. J. D. Hoffman, **Numerical Methods for Engineers and Scientists**, McGraw-Hill, 2001.
17. M.K Jain, S.R.K Iyengar and R.K Jain, **Numerical methods for scientific and engineering computation (Fourth Edition)**, New Age International (P) Limited, New Delhi, 2004.
18. S. C. Chapra, **Applied Numerical Methods with MATLAB for Engineers and Scientists**, McGraw-Hill, 2008.

S.2 APPLIED PHYSICS(BTPH-101)

UNIT I Quantum Physics:

Introduction to Quantum hypothesis, Matter wave concept, Wave Group and Particle velocity and their relations, Uncertainty principle with elementary proof and applications to

microscope and single slit, Compton Effect, Wave function and its physical significance. Development of time dependent and time independent Schrodinger wave equation, Applications of time independent Schrodinger wave equation.

UNIT II Solid State Physics:

Free electron model, Qualitative Analysis of Kronig Penney Model, effective mass, Fermi level for Intrinsic and Extrinsic semiconductors, P-N junction diode, Zener diode, Tunnel diode, Photodiode, Solar- cells, Hall Effect, Introduction to Superconductivity, Meissner effect, Type I & II Superconductors.

UNIT III Nuclear Physics:

Nuclear Structure & Properties Nuclear models: Liquid drop with semiempirical mass formula & shell model. Particle accelerators: Cyclotron, Synchrotron, Betatron. Counters and Detectors: Giger-Muller counters, Bainbridge Mass Spectrograph and Auston Mass Spectrograph.

UNIT IV Laser & Fiber Optics:

Stimulated and Spontaneous Emission, Einstein's A&B Coefficients, Population Inversion, Pumping, Techniques of Pumping, Optical Resonator, Properties and Applications of Laser, Ruby, Nd:YAG, He-Ne lasers. Introduction to Optical fibre, Acceptance angle and cone, Numerical Aperture, V- Number, Ray theory of propagation through optical fibre, Pulse dispersion , applications of optical fibre.

UNIT V Wave Optics:

Introduction to Interference, Fresnel's Bi-prism, Interference in Thin films, Newton's rings experiment, Michelson 's interferometer and its application, Introduction to Diffraction and its Types, Diffraction at single slit, double slit, resolving power, Rayleigh criterion, Resolving power of grating, Concept of polarized light, Double refraction, quarter and half wave plate, circularly & elliptically polarized light.

Text Books:

1. Engineering Physics by Dr. S. L. Gupta and Sanjeev Gupta, Dhanpat Rai Publication, New Delhi.
2. Engineering Physics by Navneet Gupta, DhanpatRai Publication, New Delhi.
3. Engineering Physics by H. J. Sawant, Technical Publications, Pune, Maharastra.
4. Engg Physics by M.N. Avdhanulu& P.G. Kshirsagar, S.Chand&Co.Edition (2010).
5. Fundamentals of Physics by Halliday, Wiley, India.

Reference Books:

1. Concepts of Modern Physics by Beiser, TMH, New Delhi.
2. Solid State Physics by Kittel,Wiley India.
3. Atomic and Nuclear physics by Brijlal and Subraminiyan.
4. LASERSs and Electro Optics by Christopher C. Davis, Cambridge Univ. Press (1996).
5. Optoelectronics an Introduction by J. Wilson &J.F.B.Hawkes, " Prentice-Hall II Edition.

6. LASER theory and applications by A. K. Ghatak&Tyagarajan, TMH (1984). 7. Optics by Ghatak, TMH.

List of Practical:

- 1. Measurement of radius of curvature “R” of convex lens by Newton“s ring experiment.**
- 2. Measurement of Numerical aperture of fiber by LASER.**
- 3. Determination of Energy band gap „Eg“ of Ge using Four Probe method.**
- 4. Measurement of Frequency of A.C. mains by electrically maintained vibrating rod.**
- 5. Measurement of Resolving Power of Telescope.**
- 6. Measurement of “λ” of LASER light source using Diffraction Grating.**
- 7. Determination of Planck“s constant by using photocell.**
- 8. Determination of Energy band gap (Eg) using PN Junction Diode.**
- 9. To determine the mass of cane sugar dissolved in water using half shade polarimeter.**
- 10. To study forward and reverse characteristics of Zener diode.**

S.3 Introduction to Computer Science and Engineering(BTCS-102)

UNIT I Introduction to Computer Fundamentals:

Introduction: What is Computer, Objectives, Hardware and software, Block Diagram of The Computer, Functions of the different Units, CPU(Central Processing Unit), Input unit, Output unit, Memory, Storage Devices, Representation of data and information, Computer Languages, Machine language, Assembly language, High level language, Number System and Conversion, Classification of Computers, History and Generations of Computer, Types of Computers, Characteristics of Computers, Introduction to Free and Open Source Software, Definition of Computer Virus, Types of Viruses, Use of Antivirus software. Applications of Computers: Home, Education and Training, Entertainment, Science, Medicine, Engineering etc.

UNIT II The Operating System:

The Graphical User Interface (GUI), Definition of Operating System, Objective, Types and functions of Operating Systems, Windows Operating System, Installing MS Windows, Working with Windows Operating System, System Tools and Applications in windows, MS-DOS (Disk Operating System), Basic DOS commands, Switching Between DOS and Windows, Comparison of DOS and Windows, System Tools and Applications in MS-DOS, Other Operating Systems Unix, Linux etc.

UNIT III Office Automation Tools-I:

Word Processing Basics, Elements of word Processing and Working, MS-Office (Word, Access, Outlook, Front page etc), Objectives, Starting MS-Word, MS-Word Screen and its Components, Working with MS-Word, Menu Bar, Creating Documents, Using Templates, Saving a documents, Working with documents, Setting up pages of a document, Printing Documents with different options, Using Tables and Columns, Object Linking and Embedding, Hyperlink, Envelopes & Label Creation, Grammar & Spell Check, Mail Merge, Macro Creation, Previewing and Printing Documents.

UNIT IV Office Automation Tools-II:

Spread Sheet: Introduction to MS-Excel, Starting MS-Excel, Basics of Workbook and Spreadsheet, MS-Excel Screen and Its Components, Features of Excel, Elementary Working with MS-Excel, Manipulation of cells, Formatting of Spreadsheet and Cells, Formulas and Functions, Spread sheets for Small accountings, Previewing and Printing a Worksheet.

Power-point: Introduction to MS-PowerPoint, Starting MS-PowerPoint, Basics of PowerPoint, MS PowerPoint Screen and Its Components, Features of PowerPoint, Elementary, Elementary Working with MS-PowerPoint, Preparation of Slides, Creation of Presentation, Providing aesthetics, Slide Manipulation and Slide Show, Presentation of the Slides.

UNIT V Computer Communication and Internet:

Computers and Communication: Introduction to Computer Networks, Internet and World Wide Web, Communication and Collaboration(Electronic Mail), Basic of electronic mail, Web Browsers and Servers, Introduction to HTML, Use of Computer in Commerce, Internet Applications, Electronic Data Interchange, Electronic Payment System, Internet Security, Privacy, Ethical Issues & Cyber Law.

Text Books:

1. E Balagurusamy , “Fundamentals of Computers ”,TMH 2009.
2. Silakari and Shukla, “Basic Computer Engineering ”, Wiley India 2011.
3. V. Rajaraman, Neeharika Adabala, “Fundamentals of Computers”, Sixth edition PHI 2015
4. Ajoy Kumar Ray and Tinku Acharya ,“ Basic Computer Engineering”, PHI 2011.
5. P K Sinha ,“Fundamentals of Computers ” ,Fourth , BPB Publications, 2004. Reference

Books:

1. J. P. Tremblay and R.B. Bunt, “An Introduction of Computer Science –An Algorithmic Approach”,TMH 2015.
2. Faith Wempen , "Computing Fundamentals: Introduction to Computers ", Wiley 2015.
3. Norton, Peter, “Introduction to Computers”, Fourth revised ,Mc-Graw-Hill 2000.
4. Reema Thareja , “Fundamental of Computers”, Oxford University Press, 2014.

List of Practical:

1. Study and Perform different MS –DOS Commands (Internal and External).
2. Create the "test" directory in the directory you are currently in using MS-DOS.
3. Study of Word – Templates, Styles.
4. Create a new user and give it Administrator privilege for Microsoft windows OS.
5. Create a MS-Word .doc file contain your complete CV.
6. Study and perform different Excel Commands/Functions.
7. Perform MS-Excel Accounting.
8. Create a MS-Excel .xls file contain mark sheet.
9. Display the student's result into a chart using MS-Excel.
10. Create a MS-Power Point Presentation .ppt file covers the topic “Computer's Evolution”.
11. Create a MS-Power Point Presentation .ppt file covers the topic “social responsibility”.
12. Create a MS-Access database .mdb file to store the results of students.
13. Study of various Network topologies.

S.4 Digital Logic and Circuit Design(BTEC-104)

UNIT I Number System & Codes:

Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1's Complement & 2 's Complement representation and their arithmetic operation, Floating point representation, binary codes, BCD,ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II Boolean algebra and Logic gates:

Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan's theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / Quine McCluskey method.

UNIT III Combinational logic:

Arithmetic circuits- Half adder, Full adder, Halfsubtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

UNIT IV Sequential logic:

Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V Semiconductor Memories and A/D and D/A converters:

Semiconductor Memory – RAM, ROM Organization, operation and their Types, PLD-PAL, PLA, PROM, FPGA, Analog to Digital (A/D)and Digital to Analog (D/A) converters and their types

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. S Salivahanan and S Arivazhagan: Digital Circuits and Design,4th Edition, Vikas Publishing House,2012.

Reference Books:

- A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI, 2016.
1. Floyd and Jain,"Digital Fundamentals", 10th Edition, Pearson Education India, 2011.
2. Roland J.Tocci,Widmer,Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson 2009.
5. Stephen Brown, ZvankoVranesic, "Fundamentals of Digital Logic Design", 3rd Edition, McGraw Hill, 2017.

List of Practical:

1. To study and test of operation of all logic gates for various IC's (IC7400, IC7403, IC408, IC74332, IC7486).
2. Verification of DeMorgan's theorem.
3. To construct of half adder and full adder.
4. To construct of half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Design a BCD to excess 3 code converter.
8. Design a Multiplexer/ Demultiplexer
9. Analysis of various flip flops with Preset and Clear capability.
10. Design of Johnson and Ring counter.
11. Design of synchronous and asynchronous up/down counters.

S.4 Principles of 'C' language (BTCS-104)

UNIT I Introduction to Programming Languages:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals Of Algorithms, Flowcharts.

UNIT II Introduction to 'C' Language:

Character Set. Variables and Identifiers, Built-In Data Types. Variable Definition, Arithmetic Operators and Expressions, Constants And Literals, Simple Assignment Statement, Basic Input/Output Statement, Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement, Structured Programming.

UNIT III One Dimensional Arrays:

Array Manipulation; Searching, Insertion, Deletion of an Element from an Array; Finding the Largest/Smallest Element in an Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of a Square Matrix, Strings as Array of Characters, Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions And Pointers, Arrays And Pointers, Pointer Arrays.

UNIT IV Top-Down Approach of Problem Solving:

Modular Programming and Functions, Standard Library of C Functions, Prototype of a Function: Formal Parameter List, Return Type, Function Call, Block Structure, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions and Arrays as Function Arguments, Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

UNIT V Concept of Files:

File Opening in Various Modes and Closing of a File, Reading from a File, Writing onto a File.

Text Books:

1. Tennence W.Pratt, “Programming languages design and implementation”, Prentice Hall of India.
2. Allen B. Tucker, “Programming Languages”, Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH publications.
4. Balagurusamy:,”Programming with C++”, ANSI C TMH

Reference Books:

1. Roosta- Foundation of Programming Languages,Vikas
2. Jeyapoovan- A First Course in Prog with C, Vikas 8. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
3. Fundamentals of Programming Languages, R. Bangia,Cyber Tech .
4. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB

S.5 Programming Skills with 'C' (BTCS-108)

Unit - 1 Introduction to Programming:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals of Algorithms, Flow Charts.

UNIT II Programming using C:

C data types, int, char, float etc, C Expressions, Arithmetic Operation, Relational and Logic Operations, C Assignment Statements, Extension of Assignment of The Operations, C Primitive Input Output Using getchar and putchar, Exposure to the scanf and printf functions, C Statements, conditional executing using if, else, Optionally Switch and Break Statements may be mentioned.

UNIT III Iterations and Subprograms:

Concept of loops, Example of Loops in C Using for, while and do-while, Optionally continue may be mentioned, One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations, Concept of Sub-programming, functions Example of functions, Argument passing mainly for the simple variables.

UNIT IV Pointers and Strings:

Pointers, Relationship Between Arrays and Pointers Argument passing using Pointers Array of Pointers, Passing arrays as Arguments, Strings and C String Library.Structure and Unions, Defining C structures, Passing Strings as Arguments Programming Examples.

Unit –V File handling:

Console Input Output Functions, Disk Input Output Functions, Data files, Command Line Arguments, Bitwise Operators, Enumerated Data Types, Type Casting, macros, The C Preprocessor, More About library Functions.

Reference Books:

1. E Balaguruswamy , Object Oriented Programming With C++ , 4th Edition , TMH, 2008
2. Brian W. Kernighan and Dennis M. Ritchie ,“The C Programming Language”, 2nd Edition, Prentice-Hall India, New Delhi, 2002
3. Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2000
4. H. Cooper and H. Mullish, Jaico Publishing House. “Spirit of C”, 4th Edition, Jaico Publishing House, 2006

List of Practical:

1. Write a program to produce ASCII equivalent of given number.
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user
 - I $(ax+b)/(ax-b)$
 - II $(x^5+10x^4+8x^3+4x+2)$
4. Write a program to find sum of a geometric series.
5. Write a program to cipher a string.
6. Write a program to check whether a given string follows English capitalization rules.
7. Write a program to find sum of the numerical series.
8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.
9. Write a recursive program for tower of Hanoi problem
10. The fibonacci sequence of numbers is 1,1,2,3,5,8..... Based on the recurrence relation
 - a. $F(n)=F(n-1)+F(n-2)$ for $n>2$
 - b. Write a recursive program to print the first m Fibonacci number
11. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
 - a) Addition of two matrices
 - b) Subtraction of two matrices
 - c) Finding upper and lower triangular matrices
 - d) Trace of a matrix
 - e) Transpose of a matrix
 - f) Check of matrix symmetry
 - g) Product of two matrices.
12. Write a program that takes two operands and one operator from the user perform the operation and then print the answer.
13. Write a program to print pyramid.
14. Write functions to add, subtract, multiply and divide two complex numbers $(x+iy)$ and $(a+ib)$ Also write the main program.
15. Write a program to copy one file to other, use command line arguments.
16. Write a program to mask some bit of a number (using bit operations).
17. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

S.6 Red Hat Administration-I (RH-124)

- Access the command line
 - Log in to a Linux system and run simple commands using the shell.
- a. Manage files from the command line
 - Copy, move, create, delete, and organize files from the bash shell prompt.
- b. Get help in Red Hat Enterprise Linux
 - Resolve problems by using online help systems and Red Hat support utilities.
- Create, view, and edit text files
 - Create, view, and edit text files from command output or in an editor.
- Manage local Linux users and groups
 - Manage local Linux users and groups, and administer local password policies.
- Control access to files with Linux file system permissions
 - Set Linux file system permissions on files and interpret the security effects of different permission settings.
- Monitor and manage Linux processes
 - Obtain information about the system, and control processes running on it.
- Control services and daemons
 - Control and monitor network services and system daemons using system
 - Configure and secure OpenSSH service
 - Access and provide access to the command line on remote systems securely using OpenSSH
 - Analyze and store logs
 - and accurately interpret relevant system log files for troubleshooting purposes.
 - Manage Red Hat Enterprise Linux networking
 - Configure basic IPv4 networking on Red Hat Enterprise Linux systems.
 - Archive and copy files between systems
 - Archive files and copy them from one system to another.
 - Install and update software packages
 - Download, install, update, and manage software packages from Red Hat and yum package repositories.
 - Access Linux file systems
 - Access and inspect existing file systems on a Red Hat Enterprise Linux system.
 - Use virtualized systems
 - Create and use Red Hat Enterprise Linux virtual machines with KVM and libvirt.
 - Comprehensive review
 - Practice and demonstrate the knowledge and skills learned in this course.

Text Books:

1. SA1 REDHAT SYSTEMADMINISTRATION I (Release en-1-20140606) By Wander Boessenkol, Bruce Wolfe, Scott McBrien, George Hacker, Chen Chang.

List of Practical:

1. Access the command line
2. Manage files from command line

- 3. Create, view, and edit text files**
- 4. Manage local Linux users and groups**
- 5. Monitor and manage Linux processes**
- 6. Control services and daemons**
- 7. Control access to files with Linux file-system permissions**
- 8. Analyze and store log files**
- 9. Configure and secure the OpenSSH service**
- 10. Install and update software packages**
- 11. Access Linux file systems**
- 12. Manage Linux networking**

- Sem 2

S.1 Mathematics-II (BTMACS-201)

UNIT I Calculus of Matrices:

Systems of linear equations and their solutions. Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices.

UNIT II Differential Equation:

Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

UNIT III Numerical Analysis Interpolation and Curve Fitting:

Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton-Gregory Polynomial Form; Lagrange Polynomial Interpolation; Approximation by Least Square Method. Numerical Differentiation and Integration: Discrete Approximation of Derivatives: Forward and Backward Difference Forms, Numerical Integration, Simple Newton-Cotes Rules: Trapezoidal and Simpson's (1/3) Rules; Weddle's Rule.

UNIT IV Numerical Solution of ODE:

Euler's Method for Numerical Solution of ODE; Modified Euler's Method; Runge-Kutta Method (RK2, RK4); Multistep Method: Predictor-Corrector method.

UNIT V Probability Theory and Random Process:

Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, Poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains.

Text Books:

1. G. Strang, **Linear Algebra And Its Applications**, 4th Edition, Brooks/Cole, 2006

2. S. L. Ross, **Differential Equations**, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, **An Introduction to Ordinary Differential Equations**, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, **Elementary Differential Equations and Boundary Value Problems**, 7th Edition, Wiley, 2001.
5. K. E. Atkinson, **Numerical Analysis**, John Wiley, Low Price Edition (2004).
6. S. D. Conte and C. de Boor, **Elementary Numerical Analysis - An Algorithmic Approach**, McGraw-Hill, 2005.
7. B. S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers, Delhi

Reference Books:

1. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, Wiley, 2005.
2. R. G. Bartle and D. R. Sherbert, **Introduction to Real Analysis**, 5th Ed, Wiley, 1999.
3. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
4. J. Stoer and R. Bulirsch, **Introduction to Numerical Analysis**, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.
5. J. D. Hoffman, **Numerical Methods for Engineers and Scientists**, McGraw-Hill, 2001.
6. M.K Jain, S.R.K Iyengar and R.K Jain, **Numerical methods for scientific and engineering computation** (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
7. S. C. Chapra, **Applied Numerical Methods with MATLAB for Engineers and Scientists**, McGraw-Hill 2008.

S.2 Computer Peripherals and Interfaces (BTCS-204)

UNIT I Memory:

Introduction to memory and its use, Memory chips and Modules: DIPP, SIPP, SIMM, DIMM, SO-DIMM, RIMM, Parity checking and ECC, ROM and its types, RAM and its types, Trouble shooting of Memory, Advanced Memory technologies: RDRAM, DDRAM, PRAM, VRAM.

UNIT II Motherboard:

Motherboard Controllers and System Resources, I/O System Bus: ISA, MCA, ELSA, VESA local bus, PCI, AGP, PCIX, Onboard I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS settings, Motherboard Form factor: AT and ATX Motherboard, LPX and NLX form factor.

UNIT III Power Supply:

Power Supply Functions and Operations, Power Supply Quality and Specifications, Power Supply and Form factors, Ventilation and Cooling: Fan, Processor cooling, Temperature limits, Power Problems and procedures, Power protection devices, Back-up power system.

UNIT IV Interfaces and I/O Ports:

Floppy Disk interface: Controller, Power cable, Control/Data cable, IDE interfaces: ATA standards, Master/Slave Configuration, Data transfer modes, SCSI interface: Bus,

Standards, Hardware's, which is better SCSI or IDE, Serial ports, Parallel ports, USB, Troubleshooting.

UNIT V Device Drives and Peripherals:

Magnetic Storage: Reading/Writing, hard disk drives, Floppy disk drives, Optical Storage devices: CD-ROM drive, DVD-ROM drive, Keyboard: layouts, interfaces, Pointing devices, Mouse, Monitors, Printers, Troubleshooting of device drivers and peripherals.

Text Books:

1. Craig Zacker & John Rourtre, PC Hardware- The complete reference, First Edition, TMH, 2017
2. S.K. Chauhan, PC Upgrading, maintenance and troubleshooting guide, First Edition,
3. B. Govindarajalu, IBM PC and CLONES: Hardware, Troubleshooting and Maintenance McGraw Hill Education, 2nd Edition 2002
4. Mark Minasi, The Complete PC Upgrade and Maintenance Guide, Sixteenth edition Wiley, 2005
5. Mike Meyers, Introduction to PC Hardware and Troubleshooting, 1st edition, McGraw Hill Education, 2017

Reference Books:

1. Stephen Bigelow, Bigelow's Troubleshooting, Maintaining & Repairing PCs, 5 edition, McGraw Hill Education, 2017
2. Manahar Lotia, Pradeep Nair, Payal Lotia, Modern Computer Hardware Course, Second Revised Edition, BPB Publications, 2007
3. Vikas Gupta, Comdex Hardware and Networking Course Kit: Revised & Upgraded, Dreamtech Press, 2014
4. Dan Gookin, Troubleshooting and Maintaining Your PC All-in-One For Dummies, 3rd edition, John Wiley & Sons, 2017
5. Robert Bruce Thompson, Barbara Fritchman Thompson, Building the Perfect PC, 3 edition, O'Reilly, 2010

List of Practical:

1. To study and demonstrate the motherboard.
2. To study microprocessor and its types.
3. To study Back Power Supply: SMPS and UPS.
4. To study the Optical Drives: CD-ROM and DVD-ROM.
5. To study the working principle of keyboard and mouse.
6. To study different types ports and slots on board.
7. To study various types of Cables and their Connectors.
8. To study the working principle of monitor.
9. To study different types of printers.
10. To study the process of assembling a Motherboard.
11. To study working of Floppy Disk Drive.

S.3 Data Structure and Algorithms (BTCS-403)

UNIT I Introduction:

Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations.
Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays.
Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

UNIT II Linked List:

Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

UNIT III Stack:

The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi. The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV Tree:

Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion. Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V Sortings:

Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

Text books:

- 1.Ashok N. Kamthane, “Introduction to Data structures”, 2nd Edition, Pearson Education India,2011.
2. Tremblay & Sorenson, “Introduction to Data- Structure with applications”, 8th Edition, Tata McGrawHill,2011.
3. Bhagat Singh & Thomas Naps, “Introduction to Data structure”, 2nd Edition, Tata McGrawHill 2009.
4. Robert Kruse, “Data Structures and Program Design”,2nd Edition,PHI,1997.
5. Lipschutz Seymour,”Data structures with C” ,1st Edition ,Mc- GrawHill,2017.

Reference Books:

1. Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.
2. ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.
3. E. Balagurusamy ,”Data Structure Using C” ,Tata McGraw-Hill 2017.
4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015
5. Gav Pai, Data Structures, Tata McGraw-Hill, 2015.

List of Practical:

1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.
3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list
10. Program for implementation of Bubble sort
11. Program for Insertion sort
12. Program for Merge Sort
13. Program to implement Heap sort
14. Program to implement Quick sort
15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. To develop an algorithm for binary tree operations and implement the same.
17. To design an algorithm for sequential search, implement and test it.
18. To develop an algorithm for binary search and perform the same.

S.4 Object Oriented Programming (BTCS-305)

UNIT-I Introduction to OOP:

Abstract data types, Objects and classes, Attributes and Methods, Objects as software units, Encapsulation and Information hiding, Objects instantiations and interactions, Object lifetime, Static and dynamic objects, global and local objects, Metaclass, Modeling the real world objects.

UNIT-II Object and Classes:

Relationships between classes, Association of objects, Types of Association, Recursive Association, Multiplicities, Navigability, Named association, Aggregation of objects. Types of Aggregation, Delegation, Modeling Association and Aggregation.

UNIT-III OOP Concepts :

Inheritance and Polymorphism, Types of Polymorphism, Static and Dynamic Polymorphism, Operator And Method Overloading, Inherited Methods, Redefined Methods, The Protected Interface, Abstract Methods and Classes, Public and Protected Properties, Private Operations, Multiple Inheritance.

UNIT-IV I/O and File management:

Concept of Streams, Cin and Cout Objects, C++ Stream Classes, Unformatted and Formatted I/O, Manipulators, File Stream, C++ File Stream Classes, File Management Functions, File Modes, Binary And Random Files.

UNIT-V C++/Java:

Exception Handling , TypeCasting ,Templates function and class in C++, Comparison Between C++ and Java, Features of Java ,Introduction to java, Inheritance, Interface and Abstract class in Java.

TEXT BOOKS:

1. David Parsons; Object oriented programming with C++; Second edition; BPB publication; 1997.
2. Robert Lafore; Object oriented programming in C++ ; Fourth edition ; Pearson publication;2002 .
3. E Balagurusamy; Object oriented programming with C++; Seven edition; TMH; 2017.
4. Herbert Schildt ; Java Complete Reference;Seven edition; McGrawHill; 2006 .

REFERENCES:

- 1.John R Hubbard; Programming in C++ (Schaum); Third edition; TMH; 2000.
- 2.Venugopal; Mastering C++ ; second edition ;TMH; 2006.
- 3.Steven Holzner; C++ Programming Black Book; First Edition; Coriolis Group,U.S;2001.
- 4.E Balagurusamy; Programming with java a primer; Fourth edition; TMH ; 2011.

S.5 Programming Skills with 'C++' (BTCS-208)

UNIT I:

Object Oriented Programming: Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies.

UNIT II: Tokens, Expression and controls Structures:

Tokens , Keywords, Identifiers and Constants, C++ data types,Variables: Declaration, Dynamic initialization of variables, Reference variables. Operators in C++ : Scope resolution operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. Functions: The

main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III: Class and Object:

Introduction, Specifying a Class, Defining Member Functions, C++ Program with Class, Nesting of Member functions, Private Member Functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructor and Destructor: Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, and Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor, Operator overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators.

UNIT IV: Inheritance and Polymorphisms:

Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT V: I/O Operations and Files:

C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put(), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good().

Text Books:

1. E Balagurusamy, Object Oriented Programming with C++, 7Th Edition, Mc Graw Hill India, 2017.
2. Robert Lafore, Object Oriented Programming In C++, 4Th Edition, 2001.
3. David Parsons, Object Oriented Programming with C++; BPB publication, 2008.
4. Hubbard, Programming in C++ (Schaum), 3rd Edition, McGraw Hill Education, 2009.

Reference Books:

1. Herbert Schildt, The Complete Reference, 4th Edition, Tata McGraw-Hill Education Pvt. Ltd.,2000.
2. K R Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education, 2017.
3. Rajaram, R., Object Oriented Programming and C++, Second Edition, 2007
4. Saurav Sahay, Object Oriented Programming with C++, Oxford, 2006.

List of Practical:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76

2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.

3. Write a function using reference variables as arguments to swap the values of a pair of integers.

4. Write a macro that obtains the largest of 3 numbers.

5. Define a class to represent a bank account. Include the following members:
Data members

- 1. Name of the depositor**
- 2. Account number**
- 3. Type of account**
- 4. Balance amount in the account**

Member functions

- 1. To assign initial values**
- 2. To deposit an amount**
- 3. To withdraw an amount after checking the balance**
- 4. To display name and balance**

Write a main program to test the program.

7. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and odd one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

7. Design a constructor for bank account class.

8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message “Required copies not in stock” is displayed.

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.

9. Improve the system design in exercise 8 to incorporate the following features:

(a) The price of the books should be updated as and when required. Use a private member function to implement this.

(b) The stock value of each book should be automatically updated as soon as a transaction is completed.

(c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.

10. Design a C++ Class „Complex“ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

11. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class

account that stores customer name, account number and type of account. From this derive the classes curacct and savacct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

- a) Accept deposit from a costumer and update the balance.
- b) Display the balance
- c) Compute and deposit interest.
- d) Permit withdrawal and update the balance.
- e) Check for the minimum balance, impose penalty, necessary and update balance.

12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it the derived class to suit their requirements.

S.6 Communication Skills (HUCS-101)

UNIT I Communication:

Nature, Meaning, Definition, Verbal and Non Verbal Communication Barriers to Communication.

UNIT II Basic Language Skills:

Grammar and usage- Parts of Speech, Tenses, S-V Agreement, Preposition, Article.

UNIT III Basic Language Skills:

Types of Sentence, Direct - Indirect, Active - Passive voice, Phrases& Clauses. UNIT IV Business Correspondence: Business Letter, Parts & Layouts of Business Resume and Job application, E-mail writing.

UNIT V Report Writing:

Importance of Report, Types of Report, Structure of a Report.

Text & Reference Books:

1. Ashraf Rizvi.(2005).Effective Technical Communication. New Delhi: Tata McGraw Hill
2. Adair, John (2003). Effective Communication. London: Pan Macmillan Ltd.
3. A.J.Thomson and A.V.Martinet(1991).A Practical English Grammar(4th ed). New York: Oxford IBH Pub.
4. Kratz, Abby Robinson (1995). Effective Listening Skills. Toronto: ON: Irwin Professional Publishing.
5. Prasad, H. M. (2001) How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill.
6. Pease, Allan. (1998). Body Language. Delhi: Sudha Publications.

List of Practical:

- 1. Self-Introduction**
- 2. Reading Skills and Listening Skills**
- 3. Oral Presentation**
- 4. Linguistics and Phonetics**
- 5. JAM (Just a Minute)**
- 6. Group Discussion**

S.7 Red Hat Administration-II (RH-134)

- **Automate installation with Kickstart**
 - Automate the installation of Red Hat Enterprise Linux systems with Kickstart.
- **Use regular expressions with grep**
 - Write regular expressions that, when partnered with grep, will allow you to quickly isolate or locate content within text files.
- **Create and Edit text files with vim**
 - the vim text editor, with which you can open, edit, and save text files.
- **Schedule future Linux tasks**
 - Schedule tasks to automatically execute in the future.
- **Manage priority of Linux processes**
 - Influence the relative priorities at which Linux processes run.
- **Control access to files with access control lists (ACL)**
 - Manage file security using POSIX access control lists.
- **Manage SELinux security**
 - Manage the Security Enhanced Linux (SELinux) behavior of a system to keep it secure in case of a network service compromise.
- **Connect to network-defined users and groups**
 - Configure systems to use central identity management services.
- **Add disks, partitions, and file systems to a Linux system**
 - Manage simple partitions and file systems.
- **Manage logical volume management (LVM) storage**
 - Manage logical volumes from the command line.
- **Access networked attached storage with network file system (NFS)**
 - Access (secure) NFS shares.
- **Access networked storage with SMB**
 - Use autofs and the command line to mount and unmount SMB file systems.
- **Control and troubleshoot the Red Hat Enterprise Linux boot process**
- **Limit network communication with firewall**
 - Configure a basic firewall.
- **Comprehensive review**

Practice and demonstrate knowledge and skills learned in this course

Text Books:

1. **1 SA2 REDHAT SYSTEMADMINISTRATION II (Release en-3-20170803)** By Wander Boessenkol, Bruce Wolfe, Scott McBrien, George Hacker, Chen Chang.

List of Practical:

1. Automate installation with Kickstart
2. Use regular expressions with grep
3. Create and Edit text files with vim
4. Schedule future Linux tasks
5. Manage priority of Linux processes
6. Control access to files with access control lists (ACL)...
7. Manage SELinux security
8. Connect to network-defined users and groups
9. Add disks, partitions, and file systems to a Linux system
10. Manage logical volume management (LVM) storage
11. Access networked attached storage with network file system (NFS)
12. Access networked storage with SMB
13. Control and troubleshoot the Red Hat Enterprise Linux boot process

- Sem 3

S.1 Discrete Structures (BTIT-401)

UNIT I Set Theory:

Definition Of Sets, Venn Diagrams, Complements, Cartesian Products, Power Sets, Counting Principle, Cardinality and Countability (Countable And Uncountable Sets), Proofs of Some General Identities on Sets, Pigeonhole Principle. Relation: Definition, Types of Relation, Composition of Relations, Domain and Range of a Relation, Pictorial Representation of Relation, Properties of Relation, Partial Ordering Relation. Function: Definition and Types of Function, Composition of Functions, Recursively Defined Functions.

UNIT II Propositional Logic:

Proposition Logic, Basic Logic, Logical Connectives, Truth Tables, Tautologies, Contradiction, Normal Forms (Conjunctive and Disjunctive), Modus Ponens and Modus Tollens, Validity, Predicate Logic, Universal and Existential Quantification. Notion of Proof: Proof by Implication, Converse, Inverse, Contrapositive, Negation, and Contradiction, Direct Proof, Proof by Using Truth Table, Proof by Counter Example

UNIT III Graph Theory:

Terminology Graph Representation Graph Isomorphism; Connectedness; Various Graph Properties; Euler and Hamiltonian Graph; Shortest Paths Algorithms. Trees: Terminology, Tree Traversals; Prefix Codes, Spanning Trees, Minimum Spanning Trees.

UNIT IV Algebraic Structure:

Binary Composition and its Properties Definition of Algebraic Structure; Groyas Semi Group, Monoid Groups, Abelian Group, Properties of Groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (Definition and Standard Results).

UNIT V Posets, Hasse Diagram And Lattices:

Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded and Complemented Lattices.

Combinatorics: Introduction, Permutation and Combination, Binomial Theorem, Multinomial Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive Algorithms, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions, Generating Functions, Solution by Method of Generating Functions.

Text Books:

1. C.L.Liu, "Elements of Discrete Mathematics", 4th Edition, Tata McGraw-Hill, 2012.
2. Kenneth H. Rosen, "Discrete Mathematics and its applications", 7th Edition, Tata McGraw-Hill, 2012.
3. V. Krishnamurthy, "Combinatorics: Theory and Applications", 2nd Edition, East-West Press, 2008.
4. Seymour Lipschutz, M.Lipson, "Discrete Mathematics", 3rd Edition, Tata McGraw Hill, 2009.

Reference Books:

1. Trembley, J.P & Manohar; "Discrete Mathematical Structure with Application CS", Tata McGraw Hill.
2. Bisht, "Discrete Mathematics", Oxford University Press, 2015.
3. Biswal, "Discrete Mathematics & Graph Theory", 3rd Edition, PHI, 2011.

S.2 Data Communication (BTCS-302)

UNIT I Introduction:

Data Communication Components, Types of Connections, Transmission Modes, Network Devices, Topologies, Protocols and Standards, OSI Model, Transmission Media, Bandwidth, Bit Rate, Bit Length, Baseband and Broadband Transmission, Attenuation, Distortion, Noise, Throughout, Delay and Jitter.

UNIT II Data Encoding:

Unipolar, Polar, Bipolar, Line and Block Codes. Multiplexing: Introduction and History, FDM, TDM, WDM, Synchronous and Statistical TDM. Synchronous and Asynchronous transmission, Serial and Parallel Transmission.

UNIT III Error Detection & Correction:

Correction, Introduction—Block Coding—Hamming Distance, CRC, Flow Control and Error Control, Stop and Wait, Error Detection and Error Go Back—N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, CSMA/CD, CDMA/CA

UNIT IV Network Switching Techniques:

Circuit, Message, Packet and Hybrid Switching Techniques. X.25, ISDN. Logical Addressing, IPv4, IPv6, Address Mapping, ARP, RARP, BOOTP and DHCP, User Datagram Protocol, Transmission Control Protocol, SCTP.

UNIT V Application Layer Protocols:

Domain Name Service Protocol, File Transfer Protocol, TELNET, WWW and Hyper Text Transfer Protocol, Simple Network Management Protocol, Simple Mail Transfer Protocol, Post Office Protocol v3.

Text books:

2. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw Hill, 2011.

Reference Books:

1. Larry L.Peterson, Peter S. Davie, "Computer Networks", Fifth Edition, Elsevier, 2012.
2. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2007.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top–Down Approach Featuring the Internet", Pearson Education, 2005.

S.3 Analysis and Design of Algorithms (BTIT-305)

UNIT 1 Algorithms Designing:

Algorithms, Analyzing Algorithms, Asymptotic Notations, Heap and Heap Sort, Brief Review of Graphs, Sets and Disjoint Set Union, Sorting and Searching Algorithms and their Analysis in terms of Space and Time Complexity. Divide and Conquer: General Method, Binary Search, Merge Sort, Quick Sort, Selection Sort, Strassen's Matrix Multiplication Algorithms.

UNIT II Greedy Method:

General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths. UNIT III Dynamic Programming: General Method, Optimal Binary Search Trees, O/1 Knapsack, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV Backtracking:

General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets. Branch and Bound: Method, O/1 Knapsack Problem, Traveling Salesperson Problem, Efficiency Considerations, Techniques for Algebraic Problems, Some Lower Bounds on Parallel Computations.

UNIT V NP Hard and NP Complete Problems:

Basic Concepts, Cook's Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamental of Computer Algorithms", 2nd Edition, Galgotia Publication, 2001.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest "Introduction to Algorithms", 3rd Edition, MIT Press, 2009.
3. Donald E Knuth, "Fundamentals of Algorithms: The Art of Computer Programming" Vol I, 3rd Edition, Pearson Education, 1997.

Reference Books:

1. Goodman, S.E. & Hedetniemi, "Introduction to Design and Analysis of Algorithm", Tata McGraw Hill, 1977.
2. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms", Tata McGraw Hill, 2006.
3. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms" TMH Publication.
4. Michael T Goodrich and Roberto Tamassia "Algorithm Design", Wiley India.

List of Practical:

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for minimum spanning trees using Kruskal's algorithm.
6. Write a program for minimum spanning trees using Prim's algorithm.
7. Write a program for single sources shortest path algorithm.
8. Write a program for Floyd-Warshall algorithm.

9. Write a program for traveling salesman problem.
10. Write a program for Hamiltonian cycle problem.

S.4 Principles of Programming Languages (BTCS-303)

UNIT I Preliminary Concepts:

Reasons for Studying, Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming, Logic Programming. Programming Language Implementation – Compilation and Virtual Machines, Programming Environments.

UNIT II Data Types:

Introduction, Primitive, Character, User Defined, Array, Associative, Record, Union, Pointer and Reference Types, Design and Implementation Uses Related to these Types. Names, Variable, Concept of Binding, Type Checking, Strong Typing, Type Compatibility, Named Constants, Variable Initialization.

UNIT III Expressions and Statements:

Arithmetic Relational and Boolean Expressions, Short Circuit Evaluation Mixed Mode Assignment, Assignment Statements, Control Structures – Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, Guarded Commands.

UNIT IV Subprograms and Blocks:

Fundamentals of Sub-Programs, Scope and Lifetime of Variable, Static and Dynamic Scope, Design Issues of Subprograms and Operations, Local Referencing Environments, Parameter Passing Methods, Overloaded Sub-Programs, Generic Sub-Programs, Design Issues for Functions Overloading and Overloaded Operators, Co-Routines.

UNIT V Abstract Data Types:

Abstractions and Encapsulation, Introductions to Data Abstraction, Static and Stack Based Storage Management. Heap Based Storage Management. Garbage Collection. Object Oriented Programming in Smalltalk, C++, Java, C#, Php, Perl. Concurrency: Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, C# Threads.

Text Books:

1. Robert .W. Sebesta —**Concepts of Programming Languages**, 10th Edition, Pearson Education,2008.
2. D. A. Watt, —**Programming Language Design Concepts**, Wiley dreamtech, rp-2007.
3. Louden and Lambart,—**Programming Languages: Principles and Practices**, 3rd Edition, Cengage Learning, 2011

Reference Books:

1. Gabbielli and Martini —**Programming Languages: Principles and Paradigms.**, Springer, 2010.
2. Peter Sestoft,—**Programming Language Concepts**, Springer, 2017.
3. A.B. Tucker, R.E. Noonan, —**Programming Languages**, 2nd Edition, Tata McGraw Hill.
4. Terrance W Pratt, "Programming Languages: Design and Implementation" Pearson Education.

List of Practical:

1. Type compatibility rules of a C compiler.
2. Compare time efficiency to run for matrix multiplication with and without subscript range checking.
3. Investigate the safety of enumeration types. Perform at-least 5 operations to determine what incorrect or silly things are legal.
4. Calculate time efficiency for large number of references to two dimensional array between subscripting and pointer arithmetic
5. Illustrates the order of evaluation of expressions used as actual parameters to a method.
6. Consider the following programming problem: The values of three integer variables— first, second, and third—must be placed in the three variables max, mid, and min, with the obvious meanings, without using arrays or user-defined or predefined subprograms. Write two solutions to this problem, one that uses nested selections and one that does not. Compare the complexity and expected reliability of the two.
7. Produces different behavior depending on whether pass-by-reference or pass-by-value result is used in its parameter passing.
8. Write a program in some language that has both static and stack dynamic local variables in subprograms. Create six large (at least 100 * 100) matrices in the subprogram—three static and three stack dynamic. Fill two of the static matrices and two of the stackdynamic matrices with random numbers in the range of 1 to 100. The code in the subprogram must perform a large

number of matrix multiplication operations on the static matrices and time the process. Then it must repeat this with the stack-dynamic matrices. Compare and explain the results.

9. Write an abstract data type for complex numbers, including operations for addition, subtraction, multiplication, division, extraction of each of the parts of a complex number, and construction of a complex number from two floating-point constants, variables, or expressions.

10. Define semaphores in Ada and use them to provide both cooperation and competition synchronization in the shared-buffer example

11. Prepare a case study on C and C++ for Readability, Writability and. Reliability

S.5 Introduction to Core Java (BTIT-309)

UNIT I The Java Environment:

Basic History of Java and its Features, JVM, JRE and JDK, its Libraries and Functionalities, Why Java? Installing Java, Java Classes and Objects, Variables and Data Types Conditional and Looping Constructs, Arrays.

UNIT II The Java Language:

Constructors, Inheritance, Packages and Interfaces, Access Specifier, Enumerations, Auto boxing, and Annotations (Metadata) Garbage collection, Nested Classes, Inner Classes

UNIT III Performance:

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, The Idea Behind Exception, Exceptions and Errors, Types of Exception, Control Flow in Exceptions, JVM Reaction to Exceptions, Use of Try, Catch, Finally, Throw, Throws in Exception Handling, In-Built and User Defined Exceptions, Checked and Un Checked Exceptions, Generics, Lambda Expressions.

UNIT IV The Java Library:

String Handling, Exploring Java.Lang, Java.Util – The Collection Framework, Exploring Java.IO, Exploring Java. NIO.

UNIT V Database Connectivity with JDBC:

Introduction to JDBC, JDBC Drivers & Architecture, CRUD Operation using JDBC

Text Books:

1. Kishore Sharan, “Beginning Java 8 Language Features”, Apress, 2014
2. E. Balagurusamy, “Programming with java A Primer”, Fourth Edition, Tata McGraw Hill, 2009.
3. Sharanam Shah, “Core Java 8 for Beginners”, Shroff Publisher, 2015.

Reference Books:

1. Herbert Schildt, “The Complete Reference Java”, Ninth Edition, McGraw Hill, 2014
2. Bert Bates, Kathy Sierra, “Head First Java”, 2nd Edition, O’ Reilly, 2005
3. Cay S Horstman and Gary Cornell, “Core Java”, Vol I & II, Pearson Education, 2013

List of Practical:

1. Write a program to show concept of Class in Java?
2. Write a program showing Type Casting
3. Write a program showing Different type of inheritance
4. Write a program showing Different types of Polymorphism
5. Write a program showing Encapsulation
6. Write a program showing Abstraction
7. Write a Multithreaded program
8. Write a program showing Checked and Unchecked Exception
9. Write a program showing Database connectivity.
10. Write a program showing Simple database Operation (CRUD)

S.6 RedHat Administration-III (RH254)

- Control services and daemons
 - Review how to manage services and the boot-up process using systemctl
- Manage IPv6 networking
 - Configure and troubleshoot basic Ipv6 networking on Red Hat Enterprise Linux systems
- Configure link aggregation and bridging
 - Configure and troubleshoot advanced network interface functionality including bonding, teaming, and local software bridges
- Control network port security
 - Permit and reject access to network services using advanced SELinux and firewalld filtering techniques
- Manage DNS for servers
 - Set and verify correct DNS records for systems and configure secure DNS caching
- Configure email delivery
 - Relay all email sent by the system to an SMTP gateway for central delivery
- Provide block-based storage
 - Provide and use networked iSCSI block devices as remote disks
- Provide file-based storage
 - Provide NFS exports and SMB file shares to specific systems and users
- Configure MariaDB databases
 - Provide a MariaDB SQL database for use by programs and database administrators
- Provide Apache HTTPD web service
 - Configure Apache HTTPD to provide Transport Layer Security (TLS)-enabled websites and virtual hosts
- Write Bash scripts
 - Write simple shell scripts using Bash
- Bash conditionals and control structures
 - Use Bash conditionals and other control structures to write more sophisticated shell commands and scripts
- Configure the shell environment
 - Customize Bash startup and use environment variables, Bash aliases, and Bash functions
- Comprehensive review
 - Practice and demonstrate knowledge and skills learned in Red Hat System Administration III

S.7 Web Development Lab-I(HTML & XML) (BTIT-307)

UNIT I Introduction to HTML:

What is HTML, HTML Documents, SGML, Basic structure of an HTML document, creating an HTML document, Headers tags, Body tags, Paragraphs formatting, Text Elements, Tag Elements, Special Character elements, Image tags, HTML Table tags and lists: Numbered list, Non- Numbered lists, Definition lists, Anchor tag, Name tag, Hyperlinks – FTP/HTTP/HTTPS, Links with images and buttons, Links to send email messages, Text fonts and styles, background colors/images, Marquee Behavior, Forms related tags. (Action, method, name, inputetc.)

UNIT II HTML5:

Introduction of HTML5, Browser supports, Migration from HTML4 to HTML5, New Elements in HTML5, HTML5 different parts layout of a web page, HTML5 Graphics: Canvas, SVG, HTML Media Tags: Inserting audio files, Inserting video files, Screen control attributes, Media control attributes, HTML Object.

UNIT III CSS:

Introduction of CSS, CSS Syntax CSS Id & Class. CSS Styling: styling Backgrounds, styling Text, styling Fonts, styling Links, styling Lists, styling Tables. CSS Box Model: Border, Outline, Margin, Padding. CSS Advanced: Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image capacity, Image Sprites, Media Types, and Attribute Selectors.

UNIT IV XML:

Introduction of XML, Cross scripting of XML, XML as intermediate language, Difference between XML and HTML, XML DOM, Tree, Syntax, Elements, Attributes, Namespaces, XPath, XML DTD, Applications, XQuery, XML Schema, XML Parser, XHTML: Introduction of XHTML, XHTML rules over the HTML, conversion HTML to XHTML.

UNIT V Java Script:

Introduction to client side scripting, Server side scripting, Java Script Syntax, Variables and Functions, Operators: JavaScript Arithmetic Operators, JavaScript Assignment Operators, JavaScript Popup Boxes, JavaScript Window, Events and Objects, JavaScript Function Call, Validation in webpages, Introduction of AJAX

Text Books:

1. Jennifer Niederst Robbins. Learning Web Design, Fifth Edition, O'Reilly Media, Inc, May 2018.
2. Frain and Ben. Responsive Web Design with HTML5 and CSS3, Second Edition, 2015.
3. Nicholas c.Zakas. Java Script for Web Developers, Third edition, 2012.

4. George Q. Huang, K. L Mak. Internet Applications in Product Design and Manufacturing, ISBN: 3540434658, 2003 edition, springer, 2012.

Reference Books:

- 1. Steven M. Schafer, “HTML, XHTML, and CSS Bible”, Fifth Edition, WileyIndia, 2010.**
- 2. John Duckett,”Beginning HTML, XHTML, CSS, and JavaScript “,WileyIndia, 2010.**
- 3. Ian Pouncey, Richard York, “Beginning CSS: Cascading Style Sheets for Web Design”,3rd edition, Wiley India, 2011.**
- 4. Achyut S. Godbole, Atul Kahate, Web Technologies, ISBN: 9781259062681,3rd edition, TMH, 2013.**

List of Practical:

- 1. Design a Web Page, Insert an image on to the web page such that image is of height 300 and width 300 pixels. The image should have an ALT text in it.**
- 2. Create a Web page that holds a bulleted list of the names of your friends. Make sure that the bullets are in plain circle.**
- 3. Create a Frame which would hold both the web page that was created earlier. The frame should be split row-wise into equal halves.**
- 4. Create a Web Page to display the marks you got in all subjects of last semester using table.**
- 5. Create a Form having two boxes with labels as First Name and Last Name. The User should not be allowed to enter the names directly in the text boxes. The input has to be given in the prompt box and then entered values should be given in the textboxes.**
- 6. Create a Web Page that has a button in the center of the page. Using mouse events change the Message in the statusbar.**
- 7. Design a Web page that accepts Username and Password. Opens a new window when the password corresponds to a particular value is set by the developer**
- 8. Design a Web page that consists of 2 text boxes. When the page is first loaded set the focus to the first textbox. The user should not be allowed to leave the box unless enters a value in it.**
- 9. To convert the HTML code to XHTML code.**
- 10. To study the XML tree.**
- 11. To study of Dreamweaver Tool.**
- 12. To study of a Flash Animation Tool.**

Text Books:

- 1. SA3 REDHAT SYSTEMADMINISTRATION III Student Workbook(Release en-2-20150427) By Wander Boessenkol, Bruce Wolfe, Scott McBrien, George Hacker, Chen Chang**

List of Practical:

- 1. Control services and daemons.**
- 2. Manage networking.**
- 3. Configure link aggregation, bridging, teaming, and bonding.**

4. Configure filters with firewalls.
5. Permit and reject access to network services using SELinux.
6. Manage DNS servers.
7. Configure SMTP email delivery.
8. Provide iSCSI block storage.
9. Configure NFS and SAMBA file-based storage.
10. Configure MariaDB SQL database.
11. Configure Apache HTTPD with TLS-enabled virtual hosts.
12. Write simple bash automation scripts.

- Sem 4

S.1 Environment and Energy Studies (ML-301)

S.2 Computer Networks(BTIT-502)

UNIT I Computer Network:

Definitions, Goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, TCP/IP model overview, Descriptions of various layers and its comparison with TCP/IP. Network standardization.

UNIT II Data Link Layer:

Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB.

UNIT III MAC Sublayer:

Overview of MAC Layer, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11 wireless Communication.

UNIT IV Network Layer:

Need, Services Provided, Design issues, Routing and congestion in network layer, wired & wireless routing protocol examples, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multi cast Routing. IP protocol, IP Addresses, subnetting, Comparative study of IPv4 & IPv6, Mobile IP.

UNIT V Transport Layer:

Overview, Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Session layer: Overview, Authentication, Session layer protocol. Presentation layer: Overview, Data conversion, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler). Application Layer: Overview, WWW and HTTP, FTP, SSH.

Text Books:

1. Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.
2. Behrouz A. Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
3. William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
4. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
5. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

Reference Books:

1. Kaveh Pahlavan, Prashant Krishnamurthy, Networking Fundamentals, Wiley Publication, 2009.
2. Michael A. Gallo & William M. Hancock, Computer Communications & Networking Technologies, Cengagepearson publications, 2001.
3. Dimitri Bertsekas, Robert Gallager, Data Networks, PHI Publication, Second Edition, 1992.
4. Ulysses Black, Computer Networks, PHI Publication, Second Edition, 1993.

List of Practical:

1. Demonstrate Different Types of Network Equipment's.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.
4. Experiment with basic network command and Network configuration commands.
5. Examine network IP.
6. Write a program to implement various types of error correcting techniques.
7. Write a program to implement various types of farming methods.
8. Implement & simulate various types of routing algorithm.
9. Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
10. Simulate STOP AND WAIT Protocols on NS-2.
11. Simulate various Routing Protocol on NS-2.
12. Simulate various Network Topologies on NS-2.
13. Configuring routers, bridges and switches and gateway on NS-2.

S.3 Operating Systems (BTCS-502)

UNIT I Introduction to Operating System:

Introduction and Need of operating system, Layered Architecture/Logical Structure of Operating system, Type of OS(Multiprogramming , Time Sharing, Real Time ,Networked, Distributed, Clustered, Hand Held), Operating system as Resource Manager and Virtual Machine, OS Services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader. Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

UNIT II Process Management:

Process Model, Creation, Termination, States & Transitions, Hierarchy, Context Switching, Process Implementation, Process Control Block, Basic System calls- Linux & Windows. Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority

Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling

UNIT III Interprocess Communication:

Introduction to Message Passing, Race Condition, Critical Section Problem, Peterson's Solution, Semaphore, Classical Problems of Synchronization Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Sleeping Barber Problem etc. Deadlock-System model, Resource types, Deadlock Problem, Deadlock Characterization, Methods for Deadlock Handling, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock Detection, Recovery from Deadlock.

UNIT IV Memory Management:

concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit and quick fit. Free space management- bitmap, link list/free list. Virtual Memory- concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging ,working set model, page fault frequency, thrashing, page replacement algorithms- optimal, FIFO, LRU; Bready's anomaly; TLB (translation look aside buffer).

UNIT V File Management:

Concepts, Naming, Attributes, Operations, Types, Structure, File Organization & Access (Sequential, Direct, Index Sequential) Methods, Memory Mapped Files, Directory Structures One Level, Two Level, Hierarchical/Tree, Acyclic Graph, General Graph, File System Mounting, File Sharing, Path Name, Directory Operations, Overview Of File System in Linux & Windows. Input/output Subsystems- Concepts, Functions/Goals, Input/Output devices- Block And Character, Spooling, Disk Structure & Operation, Disk Attachment, Disk Storage Capacity, Disk Scheduling Algorithm- FCFS, SSTF, Scan Scheduling, C-Scan Schedule.

Text books:

1. Abraham Silberschatz, "Operating system concepts", 10th Edition, John Wiley & Sons. INC, 2018
2. Andrew S. Tannanbaum, "Modern operating system", 4th Edition, Pearson Education, 2014
3. Dhananjay M. Dhamdhere, "Operating Systems: A concept Based Approach", 3rd Edition TMH, 2017,
4. Sibsankar Haldar, Alex Alagarsamy Aravind, "Operating System", 8 th Edition, Pearson Education India,, 2010

Reference Books:

2. Achyut S Godbole, "Operating System", 3rd TMH, 2017.
3. William Stalling, "operating system" 8th, Pearson Education, , 2014.
3. Vijay Shukla, "Operating System", 3rd, Kataria&Sons , 2013.
4. Singhal&Shivratri, "Advanced Concept in Operating Systems", 1st , TataMc-Graw Hill Education, edition 2017.

List of Practical:

1. Implement and update the BIOS settings of your PC.

2. If there are 5 printers are connected in a system each process to print will take different time to complete, and CPU will give a fixed time to each process after that deadline next process will enter in CPU. If a problem not completed in a given slot then that process will be reenter as per the FCFS, on rotation basis? Apply the scheduling on this?
3. Implement Non Preemptive Priority CPU Scheduling.
4. Implement Non Preemptive Shortest Job first CPU Scheduling.
5. If there are 5 different resources like 3 printer, 2 scanner are connected to a system each taking different time to complete the task. Which scheduling is best and gives best performance of CPU?
6. Implement the scheduling for that where CPU give chance to complete those process first which comes first?
7. Implement Round-Robin CPU scheduling.
8. Write a program to implement Semaphore.
9. Find the solution for the situation where 5 faculties are sitting in a round table. There are 4 ball pens are placed on this table. At a time only one pen can be picked by one faculty to writing work. What will happen if all picked the pen for writing simultaneously?
10. Find the solution for dentist checkup clinic where only one chair and one dentist is available for treatment. And having n chairs to waiting for patient.
 - If there is no patient, then the doctor sleeps in his own chair.
 - When a patient arrives, he has to wake up the doctor.
 - If there are many patients and the doctor is doing treatment of him, then the remaining patients either wait if there are empty chairs in the waiting room or they leave if no chairs are empty.
11. Write a program for Memory Management Algorithms e.g. First Fit, Best Fit, Worst Fit.
12. Demonstrate Virtual memory Techniques like, LRU, FIFO etc.
13. Implement Shortest Seek Time First Disk Scheduling Algorithm.
14. Implement Scan Scheduling Disk Scheduling Algorithm.
15. Implement Circular Scan Disk Scheduling Algorithm.
16. Implement Look Disk Scheduling Algorithm.

S.4 Database Management Systems (BTCS-405)

UNIT I

Introduction:

Concept & Overview of DBMS, Purpose of Database Systems, Architecture of DBMS, Data Models and its type, Schema and Instances, Data Independence, DBA and its function.

Entity-Relationship Model:

Entities, Attributes and its types, Mapping Cardinalities, Keys, Entity Relationship Diagram, Weak entity set and Strong entity set and Extended E-R features (Generalization , Specialization, Aggregation) ,ER Diagram to Relational Table conversion.

UNIT-II

Relational Model:

Structure of Relational Databases, Relation , Characteristics of Relations, Domains, Tuples , Relational schema and instance, Relational Algebra, Relational Algebra Operations (select, project, join and its type, union, intersection, set difference, Cartesian product, rename, division), Extended Relational Algebra Operations (Generalized Projection , Aggregate Functions , Outer Join),

Relational Calculus:

types of relational calculus, tuple and domain oriented relational calculus, and its operation.

UNIT-III

Integrity Constraints:

Null Values, Domain Constraints, Entity Integrity Constraints Referential Integrity Constraints, Key constraints, Triggers.

Relational Database Design:

Functional Dependency, Inference rule, Different Anomalies in designing a Database. Normalization , Decomposition, Normal Forms (1NF, 2NF, 3NF, BoyceCodd Normal Form, Normalization using Multi-Valued Dependencies, 4NF, Join Dependency, 5NF), Canonical cover.

UNIT IV

Query Optimization:

Introduction, steps of optimization, various algorithms to implement select, project and join operations of relational algebra, optimization methods: heuristic based, cost estimation based.

Transaction Processing, Concurrency Control and Recovery Management:

Transaction Model properties, State Serializability, Lock base protocols, Two Phase Locking, Time Stamping Protocols for Concurrency Control, and Validation Based Protocol, Multiple Granularities, Granularity of Data Item. Multi version schemes, Recovery with Concurrent Transaction, Recovery technique based on Deferred Update and Immediate Update, Shadow Paging, Recovery in Multi Database System and Database Backup and Recovery from Catastrophic Failure.

UNIT V

Index structures:

Types of index (primary, secondary, clustering, partitioning, unique and non index), use and Purpose of index, searching via an index.

SQL: DDL, DML, DQL (column function and grouping, union, multiple queries, union all, sub-query using IN, NOT IN, HAVING, GROUP BY CLAUSE), DCL (grant, revoke), TCL (Commit, roll back, save point, set Transaction)

Distributed database:

Planning for distributed database, management-centralized and decentralized Back-up and recovery.

Text books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.GrawHill, 6th Edition,2015.
2. C J Date, “An Introduction to Database System”, Pearson Educations, 8th Edition, 2004.
3. Elmasri, Navathe, “Fundamentals of Database Systems”, Pearson Educations 7th Edition, 2016.
4. SeemaKedar, Database Management System, Technical Publications, 2009. 5.
- 5.Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.

Reference Books:

1. IBM Career Education- database management system.
2. Abraham Silberschatz and S Sudarshan “Database System Concepts” 6th Edition McGraw-Hill Education – Europe 2013.
3. Raghu Ramakrishnan and Johannes Gehrke “Database Management Systems” McGrawHill Education, 2003.
4. Kahate, Atul “Introduction to Database Management Systems” Pearson Education India, 2006.

List of Practical:

1. Design a Database and create required tables. For e.g. Bank, College Database.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for table and record handling like implementing INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements and DROP, ALTER statements.
4. Write the queries for Retrieving Data from a Database Using the WHERE clause , Using Logical Operators in the WHERE clause , Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions and Combining Tables Using JOINS.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT () .
6. Write the query to implement the concept of Integrity constraints.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Display name, hire date of all employees using cursors.
10. Display details of first 5 highly paid employees using cursors.
11. Write a database trigger which fires if you try to insert, update, or delete after 7'o' clock.
12. Write a data base trigger, which acts just like primary key and does not allow duplicate values.
13. Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.
14. Write the query for creating the users and their role. Using GRANT and REVOKE operations

S.5 Advanced Java Programming (BTCS-409)

UNIT-I

J2EE Event Handling & GUI Design Event handling, AWT: Windows, Graphics, Text, AWT Controls, Layout Managers, and Menus, Images, GUI Programming with Swing, Exploring Swing, Swing Menu

UNIT-II

Java Servlet Overview, Servlet Interface, Request, Servlet context, response, Session, Dispatching request, Web Application

UNIT-III

JDBC Standard Extension 2.0 Introduction to databases (SQL ,No - SQL) Connecting to Databases – JDBC principles – Databases access – Interacting – Database search – Database support in Web applications MySQL , Model View Controller, JSP , HTML , CSS.

UNIT-IV

ORM and J2EE Frameworks: Introduction to Frameworks:- Struts, Spring basics, Spring AOP , Introduction to JavaScript and JQuery

UNIT-V

Advance J2EE Topic: JavaMail 1.2(Sending and Receiving Mail, Mail body design, different components), Java Messaging Service (JMS) 1.0.2 (Architecture, Programming Model, Connection, Session, Producer, Consumer), Java API for XML Parsing (JAXP) 1.1 (Introduction, Parsing and XML, when to use SAX)

TEXT BOOKS:

1. Arnold, Ken, James Gosling, and David Holmes. **The Java programming language.** Addison Wesley Professional, 2005.
2. Keogh, James. "The Complete Reference J2ME." published by McGrawHill OSBORNE Edition (2003)..
3. Allamaraju, Subrahmanyam, et al. "Professional Java Server Programming J2EE 1." (2001).
4. Deshmukh, Hanumant, and JigneshMalavia. SCWCD exam study kit: Java web component developer certification. Manning Publications Co., 2002.
5. Cay, Horstmann, and Cornell Gary. "Core Java 2, Volume II–Advanced Features." (2005).

REFERENCES:

1. Kito D. Mann, "Java Server Faces in Action",2nd Edition, Dreamtech Press , 4 January 2005
2. Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley, "JDBC™ API Tutorial and Reference" Third Edition, Addison Wesley, 11 June 2009).
3. GiulioZambon , "Beginning JSP, JSF and Tomcat", 2nd Edition , Apress ,29 September 2012.
4. AnghelLeonard , "JSF2.0 CookBook" ,3rd Edition , PACKT publication ,2010.
5. Bryan Basham, Kathy Sierra & Bert Bates, "Head First Servlets and JSP" , 3rd Edition , O'Reilly Media,2012.

LIST OF EXPERIMENTS:

1. How to set up multiple panels, compound borders, combo boxes.
2. Write a Program to implement Event handling.
3. Write a Program to develop Java Servlet and use request and response
4. Write a Program which allows the user to enter data in a jsp form and display in webpage
5. Show basic JDBC operation
6. Create Servlet file which contains following function:
 - 1) Connect
 - 2) Create Database
 - 3) Create table
 - 4) Insert records into respective table
 - 5) Update records of particular table of database
 - 6) Delete records from table
 - 7) Delete table and also Database.
7. Write a program to demonstrate Spring.
8. Write a program to demonstrate Spring JDBC operation.
9. Write a program to demonstrate Java Mail functionalities.
10. Write to program to demonstrate JMS queues.

S.6 Red Hat Application Development I - Java EE (JB-183)

Helping Java SE developers write Java EE applications

Red Hat Application Development I: Programming in Java EE (JB183) exposes experienced Java Standard Edition (Java SE) developers to the world of Java Enterprise Edition (Java EE). Outline for this course

- Transition to multi-tiered applications
 - Describe Java EE features and distinguish between Java EE and Java SE applications.
- Package and deploying applications to an application server
 - Describe the architecture of a Java EE application server, package an application, and deploy the application to an EAP server.
- Create Enterprise Java Beans
 - Develop Enterprise Java Beans, including message-driven beans.
- Manage persistence
 - Create persistence entities with validations.
- Manage entity relationships
 - Define and manage JPA entity relationships.
- Create REST services
 - Create REST APIs using the JAX-RS specification.
- Implement Contexts and Dependency Injection
 - Describe typical use cases for using CDI and successfully implement it in an application.
- Create messaging applications with JMS
 - Create messaging clients that send and receive messages using the JMS API.
- Secure Java EE applications
 - Use JAAS to secure a Java EE application.
- Comprehensive review of Red Hat JBoss Development I: Java EE
 - Demonstrate proficiency of the knowledge and skills obtained during the course.

LIST OF EXPERIMENTS:

1. Transition to multi-tiered applications
2. Package and deploying applications to an application server
3. Create Enterprise Java Beans
4. Manage persistence
5. Manage entity relationships
6. Create REST services
7. Implement Contexts and Dependency Injection
8. Create messaging applications with JMS
9. Secure Java EE applications

S.7 System Programming (BTCS-410)

UNIT-I Introduction & Essential Concepts:

Introduction to System Programming, Need of System Programming, Compiling with GCC, Automating the Process with GNU, Debugging with GNU Debugger, Linux Kernel, Obtaining the Kernel Source, The Kernel Source Tree, Building the Kernel.

UNIT-II Process Management:

Process, Running a New Process, Process Termination, User & Groups, Sessions and Process Groups, Daemons, Process Scheduling, Process Priorities, Multithreading, Threading Models, Concurrency, Parallelism, and Races, Synchronization.

UNIT-III File I/O:

Opening Files, Reading via read(), Writing with write(), Synchronized I/O, Direct I/O, Closing Files, User-Buffered I/O, Reading from a Stream, Writing to a Stream, Seeking a Stream, Flushing a Stream, Scatter/Gather I/O, Mapping Files into Memory, I/O Schedulers and I/O Performance.

UNIT-IV Interrupts:

Introduction, Interrupt Handlers, Top Halves versus Bottom Halves, Registering an Interrupt Handler, Writing an Interrupt Handler, Interrupt Context, Implementing Interrupt Handlers, Interrupt Control.

UNIT-V Timers:

Time's Data Structures, POSIX Clocks, Getting & Setting Time, Tuning the System Clock, Sleeping and Waiting. Memory Management: The Process Address Space, Allocating Dynamic Memory, Advanced Memory Allocation, Stack-Based Allocations, Manipulating Memory, Locking Memory.

TEXT BOOKS/ REFERENCE BOOKS:

1. Robert Love, *Linux System Programming*, Second Edition, O'Reilly Media, 2013
2. Robert Love, *Linux Kernel Development*, Third Edition, Addison Wesley, 2010
3. Mark Mitchell, Jeffrey Oldham, Alex Samuel, *Advanced Linux Programming*, First Edition, New Riders Publishing, 2001
4. Michael Kerrisk, *The Linux Programming Interface*, No Starch Press, 2010
5. Brian W. Kernighan, Rob Pike, *The UNIX Programming Environment*, Bell Laboratories, Prentice-Hall, 1984

LIST OF EXPERIMENTS:

1. Understanding GCC compilation and debugging with GNU Debugger
2. Manipulating the Linux Kernel
3. Process Management
4. Process Synchronization
5. Manipulation the files.
6. Mapping Files into Memory
7. Writing an Interrupt Handler
8. Manipulating System Time
9. Dynamic Memory Allocation
10. Manipulating the Memory

- Sem 5

S.1 Artificial Intelligence (BTCS-511)

UNIT-I Introduction:

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT-II Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search. **UNIT-III**

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networksrepresentation, construction and inference, temporal model, hidden Markov model.

UNIT-IV Markov Decision process:

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT-V Reinforcement Learning:

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd Edition, Prentice Hall.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill.
3. Trivedi, M.C., “A Classical Approach to Artifical Intelligence”, Khanna Publishing House, Delhi.
4. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011.
5. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010.

WEBSITES FOR REFERENCE:

1. <https://nptel.ac.in/courses/106105077>
2. <https://nptel.ac.in/courses/106106126>
3. <https://aima.cs.berkeley.edu>
4. [https://ai.berkeley.edu/project_overview.html \(for Practicals\)](https://ai.berkeley.edu/project_overview.html)

LIST OF PRACTICALS:

1. Write a programme to conduct uninformed and informed search.
2. Write a programme to conduct game search.
3. Write a programme to construct a Bayesian network from given data.
4. Write a programme to infer from the Bayesian network.
5. Write a programme to run value and policy iteration in a grid world.
6. Write a programme to do reinforcement learning in a grid world.
7. Mini Project work.

S.2 Software Engineering and Project Management (BTCS-504)

UNIT-I Nature of Software:

Software Engineering, Software Process, A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models- Waterfall Model, Incremental Models, Evolutionary Models, Concurrent Models, Specialized Process Model, Unified Process, Personal and Team process Models, Process technology, Agile development.

UNIT-II Functional and Non-functional Requirements:

Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented Software Development, Use case Modeling, System and Software Requirement Specifications, Requirement Validation, Traceability.

UNIT-III The Software Design Process:

Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, SA/SD Component Based Design, Design Metrics.

UNIT-IV Software Testing Strategies-

Approach: Issues, Validation Testing and Their Criteria, System Testing, Alpha-Beta Testing, Debugging, Testing Conventional Applications, Testing Object Oriented Applications ,Testing Web Applications.

UNIT-V Need and Types of Maintenance:

Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance(SQA). Project Metrics.

Text Books:

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Tata McGraw-Hill, Seventh edition, 2009.
2. Richard Fairley, “Software Engineering Concepts” –, Tata Mcgraw Hill, 2008.
3. Pankaj Jalote ,”An Integrated Approach to Software Engineering”, Narosa Pub, 2005.
4. Richard H.Thayer,”Software Enginerring & Project Managements”,Willey India

Reference:

1. Bernd Bruegge, Allen H. Dutoit,“ Object-Oriented Software Engineering” Using UML, Patterns, and Java, PEARSON Third Edition, 2017.
2. Waman S.Jawadekar,”Software Enginerring”, TMH
3. Ian Sommerville, “Software Engineering”, Seventh Edition, Pearson Education Asia, 2007.
4. Rajib Mall, “Fundamentals of Software Engineering” Second Edition, PHI Learning.

List of Practical: Select a topic of the project, and then make the report on following points

1. System Analysis

- 1.1. Identification of Need**
- 1.2. Preliminary Investigation**

2. Feasibility Study

- 2.1. Technical Feasibility**
- 2.2. Economical Feasibility**
- 2.3. Operational Feasibility**

3. Literature Survey

- 3.1. Work done by other**
- 3.2. Benefits**
- 3.3. Proposed Solution**
- 3.4. Technology used**

4. Software Engineering Approach

- 4.1. Software Engineering paradigm Applied**
 - 4.1.1. Description**
 - 4.1.2. Advantage & Disadvantages**
 - 4.1.3. Reasons for use**

4.2 Requirement Analysis

- 4.2.1 Software Requirement Specification**
 - 4.2.1.1 Glossary**
 - 4.2.1.2 Supplementary Specifications**
 - 4.2.1.3 Use Case Model**
 - 4.2.1.4 Comparative analysis documents**
- 4.2.2 Conceptual Level Activity Diagram**

4.3 Planning Managerial Issues

- 4.3.1 Planning Scope**
- 4.3.2 Project Resources**
- 4.3.3 Team Organization**
- 4.3.4 Project Scheduling**
- 4.3.5 Estimation**
- 4.3.6 Risk Analysis**
- 4.3.7 Security Plan**

4.4 Design

- 4.4.1. Design Concept**
- 4.4.2. Design Technique**
- 4.4.3. Modeling**
 - 4.4.3.1. ER Model**
 - 4.4.3.2. DFD Model**
 - 4.4.3.2.1. DFD Model Level-0 and 1**
 - 4.4.3.2.2. DFD Model Level 2 and 3**
 - 4.4.3.3. Data Dictionary**
 - 4.4.3.4. Activity Diagram**
 - 4.4.3.5. Software Architecture**

4.5 Implementation Phase

- 4.5.1. Language Used Characteristics**
- 4.5.2. Coding**

4.6 Testing

- 4.6.1. Testing Objectives**

4.6.2. Testing Methods & Strategies used along with test data and the error listed for each test case for each function provided by the system.

S.3 Cloud Computing (BTCS-701)

UNIT-I:

Overview of Cloud Computing Introduction- Evolution, Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment, Advantages, Service & Deployment Models, Infrastructure, and Consumer View, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

UNIT-II :

Cloud Computing Technology Client systems, Networks, server systems and security from services perspectives, security and privacy issues; accessing the cloud with platforms and applications; Cloud storage

UNIT-III:

Working with Cloud Infrastructure as a Service – conceptual model and working, Platform as a Service – conceptual model and functionalities. Software as a Service –conceptual model and working. Trends in Service provisioning with clouds. Working on Microsoft Azure & IBM Smart Cloud.

UNIT-IV:

Using Cloud Services Cloud collaborative applications and services – case studies with calendars, schedulers and event management; cloud applications in project management. Amazon Web Services & applications, AWS EC2, S3, Cloud Analytics, Cloud Open Stack

UNIT-V:

Case studies- Microsoft Azure, Google App Engine, IBM Smart Cloud and Open source clouds,- Open-Nebula, Sales force and Eucalyptus, Cloud Simulation

TEXT BOOKS:

1. **Cloud Computing: A Practical Approach** by Anthony T. Velte Toby J. Velte, RobertElsenpeter, 2010 by The McGraw-Hill.
2. **Buyya, Selvi ,|| Mastering Cloud Computing —,TMH Pub.**
3. **Michael Miller, Cloud computing – Web based Applications, Pearson Publishing, 2011**

REFERENCES:

1. **Kumar Saurabh, —Cloud Computing||, Wiley Pub,2012.**
2. **Krutz , Vines, —Cloud Security , Wiley Pub,2013.**
3. **Sosinsky, — Cloud Computing||, Wiley Pub,2012.**
4. **Murray Woodside; John Chinneck ; Marin Litiou on —Adaptive Cloud Deployment Using Persistence Strategies and Application Awareness||IEEEExplore, Year: 2017, Page(s):277 – 290.**

LIST OF EXPERIMENTS:

1. **Service deployment & Usage over cloud using Virtual Box.**

2. Performance evaluation of services over cloud using VMWare tool.
3. Working of Goggle Drive to make spreadsheet.
4. Working on Heroku for Cloud application deployment.
5. Working on Aneka sevices for Cloud application.
6. Working on services of Google App Engine.
7. Working on Application deployment & services of Microsoft Azure.
8. Working on Application deployment & services of IBM Smart Cloud.
9. Working and configuration of Euceliptus.
10. Deployment & Services of Amazon Web Services.

S.4 Computer Architecture and Microprocessor (BTCS-509)

UNIT-I Introduction for basic model of computer:

Von Newman architecture, Computer components, CPU, Memory, I/O, System Bus, registers, Program Counter, Accumulator, Register Transfer Language, Instruction Cycle, Instruction formats and addressing modes of basic computer. Basic arithmetic operations: addition, subtraction, multiplication, division, floating point arithmetic.

UNIT-II Control Unit Organization: Control unit operations –

Address Sequencing & Micro operations, Hardwired control unit, Micro and Nano programmed control unit, Control Memory, Micro Instruction formats, Micro program sequencer, Microprogramming.

UNIT-III Multiprocessors:

Multiprocessor organization, Instruction level pipelining, Instruction and arithmetic pipelines, Vector and array processors, GPU. Memory organization: Characteristics of Memory systems, Internal and External memories, Memory Hierarchy, High speed Memories: Cache Memory - Organization and mappings, Associative memory,

UNIT-IV Introduction of 8085 Microprocessor:

Introduction to microprocessor, 8085 microprocessor, 8085 Pin Functions, Architecture, Register Set, Flag Classification, ALU and control & timing unit, Memory Interfacing, Interfacing Input Output Devices, Memory-Mapped I/O. Timing diagram for I/O and memory read/write cycle. 8086 Microprocessor Architecture of 8086 Microprocessor, pin diagram, registers organization, memory organization, Segments, Interrupts of 8086.

UNIT-V Addressing Modes and Instruction set:

Addressing Modes of 8085 Microprocessor, Instruction Format, Opcode and operand, Classification of Instructions: Data transfer, Arithmetic, Logical, Rotate, Branch and machine Control instructions. Concept of stack and Instruction related to stack. 8085 interrupts, RST, RIM, SIM instructions, Subroutines and conditional call instruction, 8085 assembly language programming.

TEXT BOOKS:

1. Morris Mano, Computer System Architecture, Fourth edition, PHI, 2015.
2. Ramesh Gaonkar, Microprocessor Architecture, Programming, Applications with 8085, fifth Edition, Prentice Hall, 2015.
3. William Stallings, Computer Organization and Architecture, Seventh Edition, PHI, 2009.

4. A. K. Ray and K. M. Burchandi, “Intel Microprocessors Architecture Programming and Interfacing”, 3rd Edition, McGraw Hill International Edition, 2012.

REFERENCES:

- 1. B. Ram, “Fundamentals of Microprocessors And Microcontrollers”, DhanpatRai Publications, 2010.**
- 2. Douglas V. Hall, “Microprocessors and Interfacing: Programming and Hardware”, 3rd Edition, Tata McGraw Hill Publishers, 2012.**
- 3. Tanenbaum, Structured Computer Organization, First Edition, Pearson Education, 2016.**
- 4. J P Hayes, Computer Architecture and Organizations, Third edition, Mc- Graw Hills, New Delhi, 2017.**

LIST OF EXPERIMENTS (Suggested):

- 1. Write a program to move data from one register to the other.**
- 2. Demonstrate the data transfer between different registers.**
- 3. Write a program for addition and subtraction**
- 4. Write a program for multiplication and division.**
- 5. Write a program to add two 32-bit numbers.**
- 6. Write a program to add 2 decimal numbers in BCD format.**
- 7. Write a program to convert data from binary code to grey code.**
- 8. Write an Assembly language program to sum integers from 0 to 9.**
- 9. Write a program to find the smallest number from an array of N numbers.**
- 10. Write a Subroutine to find the square of given integer.**

S.5 Programming with Python (BTCS-407)

UNIT-I Introduction to Python:

The basic elements of Python, Branching programs, Strings and Input, Iteration, Functions, Scoping and Abstraction: Functions and Scoping, Specifications, Recursion, Global variables, Modules, Files.

UNIT-II Testing and Debugging:

Testing, Debugging, Structured Types, Mutability and Higher order Functions: Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries.

UNIT-III Exceptions and assertions:

Handling exceptions, Exceptions as a control flow mechanism, Assertions. Classes and Object oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and information hiding.

UNIT-IV Some simple Algorithms and Data Structures:

Search Algorithms, Sorting Algorithms, Hashtables. Plotting and more about Classes: Plotting using PyLab, Plotting mortgages and extended examples.

UNIT-V Dynamic Programming:

Fibonacci sequence revisited, Dynamic programming and the 0/1 Knapsack algorithm, Dynamic programming and divide and conquer.

TEXT BOOKS:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.
3. Mark Lutz "Learning Python" O'Reilly Media; 5 edition.
4. David Beazley "Python Cookbook, Third edition" O'Reilly Media

REFERENCES:

1. Python Essential Reference, 4th Edition Addison-Wesley Professional.
2. Mark Lutz "Programming Python: Powerful Object-Oriented Programming" David Beazley "Python Cookbook" Third edition, O'Reilly Media

LIST OF EXPERIMENTS:

1. Write a Python Program to Print Hello world!
2. Write a Program to Add Two Numbers.
3. Write a Program to Find the Square Root.
4. Write a Program to Calculate the Area of a Triangle.
5. Write a Program to Solve Quadratic Equation.
6. Write a Program to Swap Two Variables.
7. Write a Program to Generate a Random Number.
8. Write a Program to Convert Kilometers to Miles.
9. Write a Program to Convert Celsius To Fahrenheit.
10. Write a Program to check if a number is positive, negative or zero.
11. Write a Program to Check if a Number is Odd or Even.
12. Write a Program to Check Leap Year.
13. Write a Program to Find the Largest Among Three Numbers.
14. Write a Program to Check Prime Number.
15. Write a Program to Print all Prime Numbers in an Interval.
16. Write a Program to Find the Factorial of a Number.
17. Write a Program to Display the multiplication Table.
18. Write a Program to Print the Fibonacci sequence.
19. Write an English sentence with understandable semantics but incorrect syntax. Write another English sentence which has correct syntax but has semantic errors.
20. Create a program that prompts the user for a number of gallons of gasoline. Reprint that value along with its conversion equivalent number of liters.
21. Write a program that allows a user to enter his or her two favorite foods. The program should then print out the name of a new food by joining the original food names together.
22. Write a Tipper program where the user enters a restaurant bill total. The program should then display two amounts: a 15 percent tip and a 20 percent tip.
23. Write a Car Salesman program where the user enters the base price of a car. The program should add on a bunch of extra fees such as tax, license, dealer prep, and destination charge. Make tax and license a percent of the base price. The other fees should be set values. Display the actual price of the car once all the extras are applied.

- 24. Create a program with a function that calculates the area of a circle by taking a radius from the user.**
- 25. Write your own sum function called mySum that takes a list as a parameter and returns the accumulated sum.**

S.6 RedHat Open Stack and Ansible (CLDO-507)

Introduce launching an instance

Launch an instance and describe the OpenStack architecture and use cases.

Organize people and resources

Manage projects, users, roles, and quotas.

Describe cloud computing

Describe the changes in technology and processes for cloud computing.

Manage Linux networks

Administer Linux networks and bridges.

Prepare to deploy an instance with public access

Manage images, flavors, and private networks in preparation for launching an instance.

Deploy an instance

Launch and verify an instance.

Manage block storage

Manage ephemeral and persistent block storage.

Manage object storage

Administer object storage.

Prepare to deploy an external instance

Manage external networks and security in preparation for launching an instance with public access.

Deploy an instance with public access

Launch and verify an instance with public access.

Customize instances

Customize an instance with cloud-init.

Deploy scalable stacks

Deploy a stack and configure autoscaling.

Install an OpenStack overcloud

Install an OpenStack proof of concept using the director UI and provisioning service templates.

Lab: Comprehensive review of CL110

Review tasks in the Red Hat OpenStack Administration I: Core Operations for Cloud Operators course.

Introduction to Ansible

Describe Ansible concepts and install Red Hat Ansible Engine.

Deploy Ansible

Configure Ansible to manage hosts and run ad hoc Ansible commands.

Implement playbooks

Write a simple Ansible playbook and run it to automate tasks on multiple managed hosts.

Manage variables and facts

Write playbooks that use variables to simplify management of the playbook and facts to reference information about managed hosts.

Implement task control

Manage task control, handlers, and task errors in Ansible playbooks.

Deploy files to managed hosts

Deploy, manage, and adjust files on hosts managed by Ansible.

Manage large projects

Write playbooks that are optimized for larger, more complex projects.

Simplify playbooks with roles

Use Ansible roles to develop playbooks more quickly and to reuse Ansible code.

Troubleshoot Ansible

Troubleshoot playbooks and managed hosts.

Automate Linux administration tasks

Automate common Linux system administration tasks with Ansible.

Comprehensive review

Demonstrate skills learned in this course by installing, optimizing, and configuring Ansible for the management of managed hosts.

S.7 ENTERPRISE RESOURCE PLANNING (BTIT-712)

Unit I: Introduction to ERP

1. Enterprise Resource Planning –Introduction
2. Need of ERP
3. Advantages of ERP
4. Growth of ERP

Unit II: ERP and Related Technologies

1. Business process Reengineering (BPR)
2. Management Information System (MIS)
3. Decision Support Systems (DSS) Executive Support Systems (ESS)
4. Data Warehousing
5. Data Mining
6. Online Analytical Processing (OLTP)
7. Supply Chain Management (SCM)
8. Customer Relationship Management (CRM)

Unit III: Modules of ERP

1. ERP modules & Vendors Finance Production planning, control & maintenance Sales & Distribution Human Resource Management (HRM)

2. Inventory Control System.
3. Quality Management
4. ERP Market

Unit IV:

1. ERP Implementation
2. ERP Implementation Life Cycles Evaluation and selection of ERP package
3. Project planning Implementation
4. Team training & testing
5. End user training & Going Live
6. Post Evaluation & Maintenance.

Unit V: Post implementation of ERP

- 3. ERP Case Studies Post implementation review of ERP Packages in Manufacturing Services**

REFERENCES:

1. Leon, A. (2008). Enterprise Resource Planning. New Delhi; Tata McGraw-Hil Education
2. Kumar, V., Venkitakrishna, N. K. (1998). ERP - Concepts and Practice. New Delhi; PHI
3. Garg, Venkitakrishnan (2003).ERP Concepts and Planning. New Delhi; PHI Learning.

S.8 MANAGEMENT INFORMATION SYSTEM (BTIT-513)

UNIT-I Organizations and Computing:

Introduction, Modern Organization-IT enabled- NetworkedDispersed- Knowledge Organization, Information Systems in Organizations- what are information systems?, Brief history of computing- ENIAC: Way to commercial computers- Advent of artificial intelligence- advent of personal computing-Free Software Movement- Advent of Internet, The role of internet- Internet and Web: they are different-the internet changes everything

UNIT-II Managing Information Systems in Organizations:

Introduction, Managing in the Internet Era, Managing Information Systems in Organization- the IT interaction model, Challenges for the managerwhat information to build?-how much to spend on information systems?-what level of capabilities should be created with information systems?-how centralized should the services be?-what security levels are required?-what is technology road map for the organization?

UNIT-III Data and Information:

Introduction, data and information- measuring data, information as a resource, information in organizational functions, types of information technology, types of information systemstransaction processing systems-management information system.

UNIT-IV Decision making and communication:

Introduction, Decision making with MIS-Tactical decisionsoperational decisions-strategic decisions, communication in organizations- types of communicationexamples of communications in organizations- decision making with communication technology

UNIT-V Strategy:

Introduction, Information goods-properties-technology lock-in and switching costs-network externalities-positive feedback-tippy markets, information systems and competitive strategy-value chain, the Role of CIO-information system's plan-vendor coordination-technology updates-return on investment on technology.

TEXT BOOKS:

1. Kenneth C. Laudon& Jane P. Laudon, Essentials of Management Information Systems, Tenth Edition, Pearson Prentice, Hall, 2012

2. Terry Lucey, Management Information Systems, Ninth Edition, 2005, Thompson.

S.9 INFORMATION STORAGE AND MANAGEMENT (BTIT-611)

Unit-I: Introduction:

Digital data and its types, Information storage, Key characteristics of data center, Evolution of computing platforms. Introduction to storage technology: Data Proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

Unit-II: Storage System Architecture:

Intelligent disk subsystems overview, Contrast of integrants modular array, Component Architecture of Intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Unit-III: Introduction to network storage:

JBOD, DAS, NAS, SAN & CAS evolution and comparison, Applications, Elements, Connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN

Unit-IV: Hybrid storage solutions and virtualization:

memory, network, server, storage & appliances. Data centre concepts & requirements, Backup and disaster recovery. Industry Management standards, standard framework applications, Key management metrics.

Unit-V: Information storage on clouds:

concept of cloud, cloud computing, storage on cloud, Cloud benefits, Cloud computing evolution. Application & services on cloud, cloud service providers, cloud deployment models, Essential characteristics of cloud computing.

TEXT BOOK:

- 3. G.Somasundaram & Alok Shrivastava editors, ISM: Storing, Managing, and Protecting Digital Information; Wiley India**

REFERENCES:

- 1. Saurabh; Cloud Computing : Insight into New era Infrastructure; Wiley India.**
- 2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained: Basic and application of fiber channels, SAN, NAS, ISESI, INFINIBAND and FCOE, Wiley India.**
- 3. Sosinsky, Cloud Computing Bible, Wiley India.**

S.10 WIRELESS COMMUNICATION NETWORKS (BTIT-511)

UNIT-I Introduction to Wireless Communication System:

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular

radio and personal communication. Second generation Cellular Networks, Third Generation (3G) Wireless Networks ,Wireless Local Loop(WLL),Wireless Local Area network(WLAN),

UNIT-II The Cellular Concept- System Design Fundamentals:

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Cochannel and adjacent interference, Hand off Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization, Repeaters, Micro cell zone concept, Channel antenna system design considerations.

UNIT-III Mobile Radio Propagation Model, Small Scale Fading and diversity:

Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering, Link budget design, Max. Distance Coverage formula, Empirical formula for path loss, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread, Feher's delay spread, Types of small scale Fading, Rayleigh and rician distribution.

UNIT-IV Multiple Access Techniques:

Introduction, Comparisons of multiple Access Strategies TDMA, CDMA, FDMA, OFDM, CSMA Protocols. Mobile Network And Transport Layers :Mobile IP , Dynamic Host Configuration Protocol, Mobile Ad Hoc Routing Protocols, Multicast routing, TCP over Wireless Networks , Indirect TCP , Snooping TCP, Mobile TCP .Wireless Systems: GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, CDMA forward channels, CDMA reverse channels, Soft hand off, CDMA features, Power control in CDMA, Performance of CDMA System, GPRS system architecture.

UNIT-V

Introduction to Wi-Fi, WiMAX, Zig-Bee Networks, Software Defined Radio, UWB Radio, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network. Application Layer :WAP Model, Mobile Location based services ,WAP Gateway ,WAP protocols wireless bearers for WAP , WML ,WMLScripts.

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education,
2. William Stallings, "Wireless Communications and Networks", Pearson Education.
3. William D Stanley : Network Analysis with Applications, Pearson Education.
4. Roy Choudhary D: Network and systems, New Age Publication.
5. Wireless Communication, Theodore S. Rappaport, Prentice hall

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", First Edition, Pearson Education, 200UNIT III.
2. Uwe Hansmann,Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 200UNIT III.
3. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
4. Wireless digital communication, Kamilo Feher, PH.

- Sem 6

S.1 Theory of Computation (BTCS-501)

UNIT-I Introduction:

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

UNIT-II Regular Expression (RE):

Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT-III Context Free Grammar (CFG) and Context Free Languages (CFL):

Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT-IV Push Down Automata (PDA):

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT-V Turing machines (TM):

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to undecidability, undecidable problems about TM, NP hard and NP complete problem, Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

TEXT BOOKS:

1. Hopcroft and Ullman, —Introduction to Automata Theory, Languages and Computation, Pearson Education, 3rd edition, 2014
2. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Pub. House, 2011.
3. K.L.P Mishra & N.Chandrasekaran,—Theory of Computer Science, PHI Learning, 3rd edition, 2006

REFERENCES:

1. Martin J. C., —Introduction to Languages and Theory of Computations, TMH, 4th edition, 2010.
2. Papadimitriou, C. and Lewis, C. L., —Elements of the Theory of Computation, PHI, 1997.
3. Michael Sipser,—Introduction to Theory of Computation, Cengage Learning, 3rd edition, 2013.

S.2 Data Science (BTCS-608)

UNIT—I Introduction to Data Science:

Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

UNIT—II Introduction to Programming Tools for Data Science:

Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

UNIT—III Mathematical Foundations:

Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson’s Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes’s Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference

UNIT—IV Machine Learning: Overview of Machine learning concepts –

Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time SeriesLinear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning And Generalization, Overview of Deep Learning.

UNIT—V Case Studies of Data Science Application:

Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOKS & REFERENCES:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
5. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
6. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
<http://www.deeplearningbook.org>

8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

LIST OF PRACTICALS:

1. Write a programme in Python to predict the class of the flower based on available attributes.
2. Write a programme in Python to predict if a loan will get approved or not.
3. Write a programme in Python to predict the traffic on a new mode of transport.
4. Write a programme in Python to predict the class of user.
5. Write a programme in Python to indentify the tweets which are hate tweets and which are not.
6. Write a programme in Python to predict the age of the actors.
7. Mini project to predict the time taken to solve a problem given the current status of the user.

S.3 CYBER AND NETWORK SECURITY (BTIT-603)

UNIT-I

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security mechanism, Fundamental Security Design Principles, Attack Surface and Attack trees, A Model for Network Security. Introduction to Cyber crime, Cyber crime and Information Security, Classification of Cyber crimes, Cyber crime: The Legal Perspective, Cyber crime: An Indian Perspective.

UNIT-II

Introduction to Cyber offence, How Criminal plan the attack, Social Engineering, Cyber stalking, Cyber café and cyber crime, Botnets: The fuel of cybercrime, Attack vector, cloud computing. Cyber crime: Mobile and Wireless devices, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Setting for Mobile Devices, Authentication Service Security, Attack on Mobile Phones.

UNIT-III

Tools and Methods Used in Cyber crime, Proxy Server and Anonymizers, Phishing and Identity Theft, Password Cracking, Keylogger and Spyware, Virus and Worms, Trojan Horse and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attack on Wireless Networks.

UNIT-IV

Cyber crime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Information Technology Act, Digital Signature and the IT Act, Cybercrime and Punishment. Introduction to Cyber Forensics, Historical Background of Cyber Forensics, Cyber Forensics and Digital Evidence, Forensic Analysis of E-Mail, Digital Forensic Life Cycle, Approaching Computer Forensic Investigation, Relevance of OSI Model to Computer Forensic, Challenges in Computer Forensic.

UNIT-V

Network Access Control and Cloud Security, Transport- Level Security, Wireless Network Security, Electronic Mail Security, IP Security.

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security: Principles and Practice",7th Edition Pearson,2017
2. Sunit Belapure, Nina Godbole "Cyber Security",1st edition, Wiley Publication, 2011

REFERENCES:

1. Carl Endorf, Eugene Schultz, Jim Mellander "Intrusion Detection&Prevention",1st Edition, TMH,2007
2. Neal, Krawetz, Introduction to Network Security,1st Edition ,Cengage Learning,2006
3. Atul Kahate,"Cryptography and Network Security",McGraw Hill,,2009
4. Charlie Kaufman, Radia Perlman, Mike Speciner, Michael Speciner, " Network Security - Private communication in a public world" ,2nd Edition, TMH,2002
5. Fourozon, "Cryptography & Network Security" 4th Edition ,TMH,2005
6. Mayank Bhushan "Fundamentals of Cyber Security",1st Edition ,BPB Publication,2017
7. Gaurav Gupta,Sarika Gupta "Information Security and Cyber Laws",1st Edition, Khanna Book Publishing, 2011.

LIST OF PRACTICALS: At least ten practical based on the syllabus.

S.4 Block Chain (BTCS-618)

UNIT-I Introduction:

Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain. Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT-II Understanding Block chain with Crypto currency:

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT-III Understanding Block chain for Enterprises:

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT-IV Enterprise application of Block chain:

Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain.

UNIT-V Block chain application development:

Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

TEXT BOOKS:

1. Melanie Swan, —**Block Chain: Blueprint for a New Economy**¶, O'Reilly, 2015
2. Josh Thompsons, —**Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming**¶.
3. Daniel Drescher, —**Block Chain Basics**¶, Apress; 1st edition, 2017.
4. Anshul Kaushik, —**Block Chain and Crypto Currencies**¶, Khanna Publishing House, Delhi.
5. Imran Bashir, —**Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained**¶, Packt Publishing.
6. Ritesh Modi, —**Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain**¶, Packt Publishing.
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman. Ramakrishna, —**Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer**¶, Import, 2018

LIST OF PRACTICALS:

3. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on Cloud to run.

<https://github.com/hyperledger/><https://docs.docker.com/getstarted/>https://console.ng.bluemix.net/docs/services/block_chain/index.html

[https://console.ng.bluemix.net/docs/containers/container_index.html#container_index](#)

2. Create and deploy a block chain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chaincode, and perform invoke and query on your block chain network [https://developer.ibm.com/patterns/create-and-deploy-block chain-network-using-fabric-sdkjava/](https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-using-fabric-sdkjava/)

3. Interact with a block chain network. Execute transactions and requests against a block chain network by creating an app to test the network and its rules.

[https://developer.ibm.com/patterns/interacting-with-a-block chain-network/](https://developer.ibm.com/patterns/interacting-with-a-block-chain-network/)

4. Deploy an asset-transfer app using block chain. Learn app development within a Hyperledger Fabric network.

[https://developer.ibm.com/patterns/deploy-an-asset-transfer-app-using-block chain/](https://developer.ibm.com/patterns/deploy-an-asset-transfer-app-using-block-chain/)

5. Use block chain to track fitness club rewards Build a web app that uses Hyperledger Fabric to track and trace member rewards.

<https://developer.ibm.com/patterns/fitness-club-rewards-points-iot-and-retail-integration/>

6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Block chain Starter Plan. Use Hyperledger Fabric to invoke chaincode while storing results and data in the starter plan.

<https://developer.ibm.com/patterns/car-auction-network-hyperledger-fabric-node-sdk-starterplan/>

7. Develop an IoT asset tracking app using Block chain. Use an IoT asset tracking device to improve a supply chain by using Block chain, IoT devices, and Node-RED.

<https://developer.ibm.com/patterns/develop-an-iot-asset-tracking-app-using-block-chain/>

8. Secure art using block chain digital certificates. Node.js-based auction application can help democratize the art market <https://developer.ibm.com/patterns/securing-art-using-block-chain-digital-certificates/>

9. Mini projects such as :

(i) Block chain for telecom roaming, fraud, and overage management. See how communication service providers use block chain to enhance their value chains.

<https://developer.ibm.com/patterns/blockchain-for-telecom-roaming-fraud-andoveragemanagement/>

(ii) Use IoT dashboards to analyze data sent from a Block chain network. Build an IoT app and IoT dashboards with Watson IoT Platform and Node-RED to analyze IoT data sent from a Block chain network. <https://developer.ibm.com/patterns/iot-dashboards-analyze-data-block-chain-network/>

(iii) Create an Android app with Block chain integration. Build a Block chain enabled health and fitness app with Android and Kubernetes.

<https://developer.ibm.com/patterns/create-an-android-app-with-block-chain-integration/>

(iv) Create a global finance block chain application with IBM Block chain Platform Extension for VS Code. Develop a Node.js smart contract and web app for a Global Finance with block chain use case <https://developer.ibm.com/patterns/global-financing-use-case-for-block-chain/>

(v) Develop a voting application using Hyperledger and Ethereum. Build a decentralized app that combines Ethereum's Web3 and Solidity smart contracts with Hyperledger's hosting Fabric and Chaincode EVM <https://developer.ibm.com/patterns/voting-app-hyperledger-ethereum/>

(vi) Create a block chain app for loyalty points with Hyperledger Fabric Ethereum Virtual Machine. Deploy Fabric locally with EVM and create a proxy for interacting with a smart contract through a Node.js web app <https://developer.ibm.com/patterns/loyalty-points-fabric-evm/>

S.5 Introduction to container Kuberneet and RedHat OpenShift and JBOSS (DOJB-603)

Introduce container technology

Describe how software can run in containers orchestrated by Red Hat OpenShift Container Platform.

Create containerized services

Provision a server using container technology.

Manage containers

Manipulate pre-built container images to create and manage containerized services.

Manage container images

Govern the life cycle of a container image from creation to deletion.

Create custom container images

Design and code a Docker file to build a custom container image.

Deploy containerized applications on Red Hat OpenShift

Use single container applications on Red Hat OpenShift Container Platform.

Deploy multi-container applications

Set up applications that are containerized using multiple container images.

Troubleshoot containerized applications

Regulate a containerized application deployed on Red Hat OpenShift.

Comprehensive review of curriculum

Demonstrate how to containerize a software application, test it with Podman, and deploy it on a Red Hat OpenShift cluster.

Describe microservice architectures

Describe components and patterns of microservice-based application architectures.

Deploy microservice-based applications

Deploy portions of the course case study applications on an OpenShift cluster.

Implement a microservice with Micro Profile

Describe the specifications in Micro Profile, implement a microservice with some of the specifications, and deploy it to an OpenShift cluster.

Test microservices

Implement unit and integration tests for microservices.

Inject configuration data into a microservice

Inject configuration data from an external source into a microservice.

Create application health checks

Create a health check for a microservice.

Implement fault tolerance

Implement fault tolerance in a microservice architecture.

Develop an API gateway

Describe the API gateway pattern and develop an API gateway for a series of microservices.

Secure microservices with JWT

Secure a microservice using the JSON Web Token specification.

Monitor microservices

Monitor the operation of a microservice using metrics, distributed tracing, and log aggregation.

S.6 Simulation and Modeling (BTCS-612)

UNIT-I INTRODUCTION

Introduction to simulation & modeling, advantages and disadvantages of simulation, application areas in communication, computer and software design, systems and systems environment, components of a system, discrete and continuous systems, model of a system, types of models, discrete-event simulation, steps in a simulation study. Simulation Examples- Simulation of queueing systems, on-demand and inventory systems, simulation for reliability analysis, Introduction to GPSS.

UNIT-II COMPUTER BASED SYSTEM SIMULATION:

Types of System Simulation, Monte Carlo Method, comparison of analytical and Simulation methods, Markov Model, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

UNIT III INTRODUCTION TO QUEUING THEORY

Characteristics of queuing system, Poisson's formula, birth-death system, equilibrium of queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system, FSM, Petri-net Model.

UNIT-IV VERIFICATION AND VALIDATION

Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions , Validating Input & Output Transformations, Design of simulation experiments,

UNIT-V SIMULATION TOOLS Simulation Tools –

Model Input – High level computer system simulation – CPU – Memory, Simulation – Comparison of systems via simulation – Simulation Programming techniques, Development of Simulation models, General Purpose Simulation Package-MATLAB, ARENA, EXTEND, Study of SIMULA, DYNAMO

TEXT BOOKS:

- 1 Gordon G., **System simulation**, PHI Learning
- 2.Singh V.P **System Simulation and Modeling** NEW AGE INTERNATIONAL, PUBLISHERS
- 3.Taha H, **Operations Research**; PHI.
- 4.Payer, T., **Introduction to system simulation**, McGraw Hill.
- 5.Spriet JA; **Computer Aided Modeling and Simulation**, Academic Press INC; USA

REFERENCES:

1. J K Sharma, **Operations Research Theory and Application**, Pearson Education Pvt Ltd, 2 Edition Banks J; **Hand book of Simulation**; John Wiley.
- 2.Law AM and Kelton WD; **Simulation Modeling and Analysis**; TMH

LIST OF EXPERIMENTS:

1. Simulate CPU scheduling algorithm using queueing system.
2. Simulate multiplexer using queueing system.
3. Simulate Network congestion control algorithms using Petri-net Model.
4. Simulate disk scheduling algorithms Petri-net Model.
5. Verification and validation of Petri-net Model.
6. Simulate a Manufacturing shop and write a program in GPSS.
7. Simulate Telephone system model and write a program in SIMSCRIPT.
8. Graphical Simulation and Modeling using MATLAB.
9. Study of SIMULA.
10. Study of DYNAMO.

S.7 Software Testing and Quality Assurance (BTCS-613)

UNIT-I BASIC CONCEPTS:

Basic Testing Vocabulary, Quality Assurance versus Quality Control, The Cost of Quality, Software Quality Factors, Software Defect, The Multiple Roles of the Software Tester(People Relationships), Scope of Testing, Testing Constraints, Various software development Life cycles (SDLC), Independent Testing, QA Process, Levels of Testing, The —VI Concept of Testing.

UNIT-II WHITE BOX TESTING:

White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis.

UNIT-III BLACK BOX TESTING:

Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning -Syntax testing - Finite state testing - Levels of testing – Unit testing- Integration Testing

UNIT-IV SYSTEM TESTING –

Functional testing-non-Functional testing-acceptancetestingperformance testing –Factors and Methodology for Performance testing, Regression testingMethodology for Regression-testing.Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, Quality Characteristics, Software Quality Standard

UNIT-V ADVANCE SOFTWARE TESTING METHOD (OBJECT ORIENTED TESTING):

Syntax testing - Finite State testing - Levels of testing - Unit, Integration and System Testing. Challenges - Differences from testing non-OO Software - Class testing strategies - State-based Testing Software quality Assurance: ISO 9000; CMM and Test Management Issues; Quality Assurance personnel Issues.

TEXT BOOKS:

1. KshirasagarNaik&PriyadarshiTripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,Software Enginerring, TMH
4. Sommerville,Software Enginerring,Pearson Education.
- 5.—IBM CE-Enablement Program- Essentials of Software Engineering (OOAD & SW Lifecycle), IBM Career Education

REFERENCES:

1. KshirasagarNaik&PriyadarshiTripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,Software Enginerring, TMH
4. Sommerville,Software Enginerring,Pearson Education.
5. <http://www.softwaretestinghelp.com/online-software-testing-course-syllabus/>
6. <https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/1217201473127725.pdf>
7. <http://www.tutorialspoint.com/uml/>

LIST OF EXPERIMENTS:

1. Design test cases using Boundary value analysis by taking quadratic equation problem.
2. Design test cases using Equivalence class partitioning taking triangle problem.
3. Design test cases using Decision table taking triangle problem.
4. Design independent paths by calculating cyclometer complexity using date problem.
5. Design independent paths by taking DD path using date problem.
6. Design the test cases for login page of AMIZONE.
7. Manual Testing for PAN card verification.
8. Generate test case for ATM machine.
9. Overview of Testing process using Rational Robot.

- 10.** Write a script to record verification point using Rational Robot (For GUI testing of single click on window OS).
- 11.** Write a script to record verification point for Clip Board and alphanumeric values using Rational Robot.

S.8 Robotics (BTCS-617)

UNIT-I Introduction to Robotics:

Types and components of a robot, Classification of robots, closedloop and open-loop control systems.Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT-II Robot Kinematics and Dynamics:

Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT-III Sensors and Vision System:

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity /Affine/Projective transformations. Vision applications in robotics.

UNIT-IV Robot Control:

Basics of control: Transfer functions, Control laws: P, PD, PID. Non-linear and advanced controls.

UNIT-V Robot Actuation Systems:

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

TEXT BOOKS:

- 1. Saha, S.K., —Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.**
- 2. Ghosal, A., —Robotics, Oxford, New Delhi, 2006.**
- 3. Niku Saeed B., —Introduction to Robotics: Analysis, Systems, Applications, PHI, New Delhi.**
- 4. Mittal R.K. and Nagrath I.J., —Robotics and Control, Tata McGraw Hill.**
- 5. Mukherjee S., —Robotics and Automation, Khanna Publishing House, Delhi.**
- 6. Craig, J.J., —Introduction to Robotics: Mechanics and Control, Pearson, New Delhi, 2009**
- 7. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, —Robot Modelling and Control, John Wiley and Sons Inc, 2005**
- 8. Steve Heath, —Embedded System Design, 2nd Edition, Newnes, Burlington, 2003.**
- 9. Merzouki R., Samantaray A.K., Phatak P.M. and Bouamama B. Ould, —Intelligent Mechatronic System: Modeling, Control and Diagnosis, Springer.**

LIST OF PRACTICALS:

- 1. Study components of a real robot and its DH parameters.**
- 2. Forward kinematics and validate using a software (Robo Analyser or any other free software tool).**
- 3. Inverse kinematics of the real robot and validation using any software.**
- 4. Use of open source computer vision programming tool openCV.**
- 5. Image Processing using openCV.**
- 6. Image Processing for color/shape detection.**
- 7. Positioning and orientation of robot arm.**
- 8. Control experiment using available hardware or software.**
- 9. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.**
- 10. Project work**

- Sem 7

S.1 Human Values and Professional Ethics (BBAI-501)

Unit I: Human Value

- 1. Definition, Essence, Features and Sources**
- 2. Sources and Classification**
- 3. Hierarchy of Values**
- 4. Values Across Culture**

Unit II: Morality

- 1. Definition, Moral Behaviour and Systems**
- 2. Characteristics of Moral Standards**
- 3. Values Vs Ethics Vs Morality**
- 4. Impression Formation and Management**

Unit III: Leadership in Indian Ethical Perspective.

- 1. Leadership, Characteristics**
- 2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)**
- 3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).**

Unit IV: Human Behavior – Indian Thoughts

- 1. Business Ethics its meaning and definition**
- 2. Types, Objectives, Sources, Relevance in Business organisations.**
- 3. Theories of Ethics, Codes of Ethics**

Unit V: Globalization and Ethics

- 3. Sources of Indian Ethos & its impact on human behavior**
- 2. Corporate Citizenship and Social Responsibility – Concept (in Business),**
- 3. Work Ethics and factors affecting work Ethics.**

Suggested Readings

- 1. Beteille, Andre (1991). Society and Politics in India. AthlonePress:New Jersey.**
- 2. Chakraborty, S. K. (1999). Values and Ethics for Organizations. oxford university press**
- 3. Fernando, A.C. (2009). Business Ethics - An Indian Perspective .India: Pearson Education: India**
- 4. Fleddermann, Charles D. (2012). Engineering Ethics. New Jersey: Pearson Education / Prentice Hall.**
- 5. Boatright, John R (2012). Ethics and the Conduct of Business.Pearson. Education: New Delhi.**
- 6. Crane, Andrew and Matten, Dirk (2015). Business Ethics. Oxford University Press Inc:New York.**
- 7. Murthy, C.S.V. (2016). Business Ethics – Text and Cases. Himalaya Publishing House Pvt. Ltd:Mumbai**
- 8. Naag Rajan, R.R (2016). Professional Ethics and Human Values. New Age International Publications:New Delhi.**

S.2 Compiler Design (BTCS-601)

Unit – I: Introduction:

Compiler, Compilers analysis of the source program, Phases of a compiler, Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens. Unit – II: Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

Unit – III: Intermediate Code Generation:

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

Unit – IV: Code Optimization and Run Time Environments:

Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

Unit – V: Code Generation:

Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

Text Books:

1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

References:

1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

List of Experiments:

1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.
7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.

S.3 Computer Graphics and Multimedia (BTCS-503)

UNIT I Introduction to Computer Graphics:-

What is Computer Graphics?, Where Computer Generated pictures are used, Elements of Pictures created in Computer Graphics Graphics display devices,Graphics input primitives and Devices.**Introduction to openGL:-** Getting started Making pictures, Drawing basic primitivesSimple interaction with mouse and keyboard

UNIT II Points and Lines, AntialiasingLine Drawing Algorithm:-

DDA line drawing algorithm, parallel drawing algorithm**Bresenham's drawing algorithm** with example. **Circle and Ellipse generating algorithms**:-**Mid-point Circle algorithm** with example **Mid-point Ellipse algorithm****Mid-point Ellipse algorithm** with example **Parametric Cubic Curves**:- **Bezier curves****B-Spline curves** **Filled Area Primitives**:-**Scan line polygon fill algorithm**, **Pattern fill algorithm** **Inside-Outside Tests**, **Boundary fill algorithms**, **Flood fill algorithms**

UNIT III

2D Geometric Transformations -

Basic transformation, Matrix representation and Homogeneous Coordinates Composite transformationOther transformations. Transformation between coordinated systems.Window to Viewport coordinate transformation,

Clipping operations –

Point clipping, Line clipping:- Cohen – Sutherland line clipping Liang – Barsky line clipping Midpoint subdivision

Polygon Clipping-Sutherland –

Hodgeman polygon clipping Weiler – Atherton polygon clipping. 3D object representation methods B-REP , sweep representations , CSG

Basic transformations-

Translation, Rotation, Scaling

Other transformations-

Reflection, Rotation about an arbitrary axis Composite transformations Projections – Parallel and Perspective 3D clipping

UNIT IV

3D Geometric Transformations and 3D Viewing Classification of Visible

Surface Detection algorithm:-

Translation, Rotation, Scaling

Other transformations:-

Reflection, Rotation about an arbitrary axis Composite transformations Projections, Back Surface detection method Depth Buffer method Scan line method BSP tree method, Area Subdivision method.

UNIT V Multimedia System:

An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards.i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP, MOV, MPEG , compression standards, compression through spatial and temporal redundancy. Multimedia Authoring .

TEXT BOOKS:

1. Sinha and Udai , "Computer Graphics", Tata McGraw Hill
2. Parekh "Principles of Multimedia" Tata McGraw Hill
3. Prabhat k Andleigh, Kiran Thakral , "Multimedia System Design " PHI Pub.
4. Donald Hearn and M.P. Becker "Computer Graphics" Pearson Pub.

REFERENCES:

1. Computer Graphics, C Version, 2e Paperback – 2002
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. David F Rogers, "Procedural elements for Computer Graphics", Tata McGraw Hill, Second Edition.

5. Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice in C", Second edition, Pearson Education.
6. David Hillmaa, "Multimedia Technology & Applications, Delmar, 1998.

LIST OF EXPERIMENTS:

1. Implement DDA Line Drawing algorithm
2. Implement Bresenham's line drawing algorithm.
3. Implement Mid-Point circle drawing algorithm.
4. Implement Mid-Point ellipse drawing algorithm.
5. Implement cubic Bezier curve.
6. Implement a menu-driven program for 2D transformations.
7. Implement Line clipping algorithm using Cohen-Sutherland.
8. Implement Polygon Clipping using Sutherland Hodgeman.
9. Implement Scan line fill algorithm.
10. Study of Multimedia and Program for Flash.

S.4 Object Oriented Analysis and Design (BTIT-604)

UNIT-I Introduction:

About Object Orientated Technology, Development and OO Modeling History. Modeling Concepts: Modeling design Technique, Three models, Class Model, State model and Interaction model.

UNIT-II Class Modeling:

Object and class concepts, link and association, Generalization and Inheritance, Advanced class modeling- aggregation, Abstract class meta data, constraints. State Modeling: Event, state, Transition and conditions, state diagram, state diagram behavior, concurrency, Relation of Class and State models. Interaction Modeling: Use case Models, sequence models, activity models

UNIT-III Analysis and Design:

Development Life cycle, Development stages, Domain Analysis-Domain class model, domain state model, domain interaction model, Iterating and analysis. Application Interaction model, Application class model, Application state Model, Adding operation.

UNIT-IV System Design:

Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage, Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

UNIT-V Class design:

Overview of class design, designing algorithms recursing downward, refactoring, design optimization, Adjustment of Inheritance, Rectification of Behavior.

TEXT BOOKS:

2. Michael Blaha and J. Rumbugh, —Object oriented Modeling and design with UML, Pearson Education

REFERENCES:

1. Satzinger, Jackson and Burd, —Object oriented Analysis and design with the Unified Process, CENGAGE Learning.
2. O'Docherty, —Object Oriented Analysis and Design Understanding, System Development with UML2.0, Wiley India.

LIST OF EXPERIMENTS

1. How to write a Problem Statement
2. Perform the system analysis: Requirement analysis, SRS.
3. Perform the function oriented diagram: DFD and Structured chart.
4. Perform the user's view analysis: Use case diagram.
5. Draw the structural view diagram: Class diagram, object diagram.
6. Draw the behavioral view diagram: Sequence diagram, Collaboration diagram.
7. Draw the behavioral view diagram: State-chart diagram, Activity diagram.
8. Draw the implementation view diagram: Component diagram.
9. Draw the environmental view diagram: Deployment diagram.

S.5 Next Generation Telecommunication Networks (BTCC-703)

UNIT-I

Basic history of Mobile Computing Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing.

UNIT-II

Next Generation Networks (NGN), Principles and definition of an NGN, The NGN architecture, Outline of technology choices, Network and implementation issues with NGN, Numbering & Addressing

UNIT-III

Wireless n/w. and Technologies Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G, Bluetooth, Radio frequency identification(Rfid), Wireless Broadband, Mobile IP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. ,IPv6

UNIT-IV

Next Generation Core NetworkThe role of the core network, Enabling Control and Reconfigurability, Packet Switching (ATM, IP, MPLS, Ethernet), IP Multi-Media System (IMS), Principles of control for IP networks, Concept of IMS UNIT-V NGN Service AspectsServices on an NGN, Service compatibility with PSTN and IN, Use of APIs and service

provider interfaces, Brief review of the principles of mobile networks, Relationship of mobile developments to NGN

TEXT BOOKS

1. VALDAR, A R: 'Understanding Telecommunications Networks', IET Telecommunications Series 52, 2006
2. Convergence Technologies for 3G Networks: IP, UMTS, EGPRS and ATM Authors: Jeffrey Bannister, Paul Mather, and Sebastian Cope. . John Wiley & Sons, Ltd. ISBN 0-470-86091-X (HB)
3. Mobile Computing , Asoke K Telukder, Roopa R Yavagal, TMH
4. Wireless Communications and Networks, 3G and beyond, ITI SahaMisra, TMH

REFERENCES

1. M Carugi "Introduction to the ITU-T NGN focus group release 1: target environment, services, and capabilities," Communications Magazine, IEEE, vol.43, no.10, pp. 42- 48, Oct. 2005
2. Chae-Sub Lee, Knight, D. , "Realization of the next-generation network," Communications Magazine, IEEE, vol.43, no.10, pp. 34- 41, Oct. 2005.

S.6 Soft computing (BTCS-711)

UNIT-I

Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems, Soft Computing and its Techniques, Soft Computing verses Hard Computing. Applications of Soft Computing in the Current industry.

UNIT-II

Introduction to Fuzzy Logic, Crisp Sets, Fuzzy Sets, Fuzzy Relations, Membership Functions and features, Fuzzification, Methods of Membership Value Assignments, Defuzzification and methods, Lambda cuts. Fuzzy Measure, Fuzzy Reasoning, Fuzzy Inference System.

UNIT-III

Neural Network (NN), Biological foundation of Neural Network, Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Netsand applications of Neural Network

UNIT-IV

Genetic Algorithm, Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

UNIT-V

Neuro-Fuzzy and Soft Computing, Adaptive Neuro-Fuzzy Inference System Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN. Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. Hybridization of other techniques.

TEXT BOOKS:

1. S.N. Deepa and S.N. Sivanandam, **Principles of Soft Computing**, 2ed., Wiley, 2011
2. Vojislav Kecman, **Learning and Soft Computing - Support Vector Machines, Neural Networks, and Fuzzy Logic Models**, 1ed., The MIT Press, 2001.
3. D. K. Pratihar, **Soft Computing**, 1ed., Alpha Science, 2007.
4. Timothy J. Ross, **Fuzzy logic with Engineering Applications**, 3ed., John Wiley and Sons, 2010.
5. S. Rajasekaran and G.A.V. Pai, **Neural Networks, Fuzzy Logic and Genetic Algorithms**, 2ed. PHI
6. David E. Goldberg, **Genetic Algorithms in search, Optimization & Machine Learning**, 1ed., AddisonWesley Publishing Company, 1989

REFERENCES:

1. Jang, Sun and Mizutani, **Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence**, 1ed., Pearson, 1997.
2. George J. Klir and Bo Yuan, **Fuzzy Sets and Fuzzy Logic: Theory and Applications**, 1ed., Prentice Hall, 1995
3. Simon Haykin, **Neural Networks: A Comprehensive Foundation**, 2ed. Prentice Hall, 1998
4. Samir Roy and UditChakraborty, **A Beginners Approach to Soft Computing**, 1ed., Pearson, 2013

S.7 Quantum Computing (BTCS-715)

UNIT-I Introduction to Quantum Computing:

Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing, Overview of major concepts in Quantum Computing: Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement.

UNIT-II Math Foundation for Quantum Computing:

Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT-III Building Blocks for Quantum Program:

Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc, Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

UNIT–IV Quantum Algorithms:

Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks, Major Algorithms: Shor’s Algorithm, Grover’s Algorithm, Deutsch’s Algorithm, Deutsch -Jozsa Algorithm,

UNIT–V OSS Toolkits for implementing Quantum program:

IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)

TEXT BOOKS & REFERENCES:

1. Michael A. Nielsen, “Quantum Computation and Quantum Information”, Cambridge University Press.
2. David McMahon, “Quantum Computing Explained”, Wiley.
3. IBM Experience: <https://quantumexperience.ng.bluemix.net>
4. Microsoft Quantum Development Kit <https://www.microsoft.com/en-us/quantum/development-kit>
5. Forest SDK PyQuil: <https://pyquil.readthedocs.io/en/stable/>

S.8 Virtual Reality (BTCS-716)

UNIT–I Introduction to Virtual Reality:

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark. 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

UNIT–II Geometric Modelling:

Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation. Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection. Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

UNIT–III Virtual Environment:

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT–IV VR Hardware and Software: Human factors:

Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

UNIT–V VR Applications:

Introduction, Engineering, Entertainment, Science, Training. The Future: Virtual environment, modes of interaction

TEXT BOOKS & REFERENCES:

1. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
2. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
3. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006.
5. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application and Design", Morgan Kaufmann, 2008.
6. www.vresources.org
7. www.vrac.iastate.edu
8. www.w3.org/MarkUp/VRM

4) B.tech (ICS)

- Sem 1

S.1 Mathematics – (BTMACS-101)

UNIT I Differential Calculus:

Limits of functions, continuous functions, uniform continuity, monotone and inverse functions. Differentiable functions, Rolle's theorem, mean value theorems and Taylor's theorem, power series. Functions of several variables, partial derivatives, chain rule, Tangent planes and normals. Maxima, minima, saddle points, Lagrange multipliers, exact differentials

UNIT II Integral Calculus:

Riemann integration, fundamental theorem of integral calculus, improper integrals. Application to length, area, volume, surface area of revolution. Multiple integrals with application to volume, surface area, Change of variables.

UNIT III Numerical Analysis:

Number Representation and Errors: Numerical Errors; Floating Point Representation; Finite Single and Double Precision Differences; Machine Epsilon; Significant Digits. **Numerical Methods for Solving Nonlinear Equations:** Method of Bisection, Secant Method, False Position, Newton-Raphson's Method, Multidimensional Newton's Method, Fixed Point Method and their convergence.

UNIT IV Numerical Methods for Solving System of Linear Equations:

Norms; Condition Numbers, Forward Gaussian Elimination and Backward Substitution; Gauss-Jordan Elimination; FGE with Partial Pivoting and Row Scaling; LU Decomposition; **Iterative Methods:** Jacobi, Gauss Siedal; Power method and QR method for Eigen Value and Eigenvector.

UNIT V Vector Calculus:

Gradient and directional derivative. Divergence and Curl of Vector point function, line and surface integrals. Green“s, Gauss“ and Stokes“ theorems and their applications.

Text Books:

16. T. M. Apostol, Calculus, Volume I, 2nd Ed, Wiley, 1967.
17. T. M. Apostol, Calculus, Volume II, 2nd Ed, Wiley, 1969.
18. K. E. Atkinson, Numerical Analysis, John Wiley, Low Price Edition(2004).
19. S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 2005.
20. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

Reference Books:

19. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.
20. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
21. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
22. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, 2001.
23. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
24. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill, 2008.

S.2 APPLIED PHYSICS(BTPH-101)

UNIT I Quantum Physics:

Introduction to Quantum hypothesis, Matter wave concept, Wave Group and Particle velocity and their relations, Uncertainty principle with elementary proof and applications to microscope and single slit, Compton Effect, Wave function and its physical significance. Development of time dependent and time independent Schrodinger wave equation, Applications of time independent Schrodinger wave equation.

UNIT II Solid State Physics:

Free electron model, Qualitative Analysis of Kronig Penney Model, effective mass, Fermi level for Intrinsic and Extrinsic semiconductors, P-N junction diode, Zener diode, Tunnel diode, Photodiode, Solar- cells, Hall Effect, Introduction to Superconductivity, Meissner effect, Type I & II Superconductors.

UNIT III Nuclear Physics:

Nuclear Structure & Properties Nuclear models: Liquid drop with semiempirical mass formula & shell model. Particle accelerators: Cyclotron, Synchrotron, Betatron. Counters and Detectors: Giger-Muller counters, Bainbridge Mass Spectrograph and Aston Mass Spectrograph.

UNIT IV Laser & Fiber Optics:

Stimulated and Spontaneous Emission, Einstein's A&B Coefficients, Population Inversion, Pumping, Techniques of Pumping, Optical Resonator, Properties and Applications of Laser, Ruby, Nd:YAG, He-Ne lasers. Introduction to Optical fibre, Acceptance angle and cone, Numerical Aperture, V- Number, Ray theory of propagation through optical fibre, Pulse dispersion , applications of optical fibre.

UNIT V Wave Optics:

Introduction to Interference, Fresnel's Bi-prism, Interference in Thin films, Newton's rings experiment, Michelson 's interferometer and its application, Introduction to Diffraction and its Types, Diffraction at single slit, double slit, resolving power, Rayleigh criterion, Resolving power of grating, Concept of polarized light, Double refraction, quarter and half wave plate, circularly & elliptically polarized light.

Text Books:

1. Engineering Physics by Dr. S. L. Gupta and Sanjeev Gupta, Dhanpat Rai Publication, New Delhi.
2. Engineering Physics by Navneet Gupta, DhanpatRai Publication, New Delhi.
3. Engineering Physics by H. J. Sawant, Technical Publications, Pune, Maharastra.
4. Engg Physics by M.N. Avdhanulu& P.G. Kshirsagar, S.Chand&Co.Edition (2010).
5. Fundamentals of Physics by Halliday, Wiley, India.

Reference Books:

1. Concepts of Modern Physics by Beiser, TMH, New Delhi.
2. Solid State Physics by Kittel,Wiley India.
3. Atomic and Nuclear physics by Brijlal and Subraminiyan.
4. LASERSs and Electro Optics by Christopher C. Davis, Cambridge Univ. Press (1996).
5. Optoelectronics an Introduction by J. Wilson &J.F.B.Hawkes, " Prentice-Hall II Edition.
6. LASER theory and applications by A. K. Ghatak&Tyagarajan, TMH (1984). 7. Optics by Ghatak, TMH.

List of Practical:

1. Measurement of radius of curvature "R" of convex lens by Newton"s ring experiment.
2. Measurement of Numerical aperture of fiber by LASER.
3. Determination of Energy band gap „Eg“ of Ge using Four Probe method.
4. Measurement of Frequency of A.C. mains by electrically maintained vibrating rod.
5. Measurement of Resolving Power of Telescope.
6. Measurement of “ λ ” of LASER light source using Diffraction Grating.
7. Determination of Planck"s constant by using photocell.
8. Determination of Energy band gap (Eg) using PN Junction Diode.
9. To determine the mass of cane sugar dissolved in water using half shade polarimeter.
10. To study forward and reverse characteristics of Zener diode.

S.3 Introduction to Computer Science and Engineering(BTCS-102)

UNIT I Introduction to Computer Fundamentals:

Introduction: What is Computer, Objectives, Hardware and software, Block Diagram of The Computer, Functions of the different Units, CPU(Central Processing Unit), Input unit, Output unit, Memory, Storage Devices, Representation of data and information, Computer Languages, Machine language, Assembly language, High level language, Number System and Conversion, Classification of Computers, History and Generations of Computer, Types of Computers, Characteristics of Computers, Introduction to Free and Open Source Software, Definition of Computer Virus, Types of Viruses, Use of Antivirus software. Applications of Computers: Home, Education and Training, Entertainment, Science, Medicine, Engineering etc.

UNIT II The Operating System:

The Graphical User Interface (GUI), Definition of Operating System, Objective, Types and functions of Operating Systems, Windows Operating System, Installing MS Windows, Working with Windows Operating System, System Tools and Applications in windows, MS-DOS (Disk Operating System), Basic DOS commands, Switching Between DOS and Windows, Comparison of DOS and Windows, System Tools and Applications in MS-DOS, Other Operating Systems Unix, Linux etc.

UNIT III Office Automation Tools-I:

Word Processing Basics, Elements of word Processing and Working, MS-Office (Word, Access, Outlook, Front page etc), Objectives, Starting MS-Word, MS-Word Screen and its Components, Working with MS-Word, Menu Bar, Creating Documents, Using Templates, Saving a documents, Working with documents, Setting up pages of a document, Printing Documents with different options, Using Tables and Columns, Object Linking and Embedding, Hyperlink, Envelopes & Label Creation, Grammar & Spell Check, Mail Merge, Macro Creation, Previewing and Printing Documents.

UNIT IV Office Automation Tools-II:

Spread Sheet: Introduction to MS-Excel, Starting MS-Excel, Basics of Workbook and Spreadsheet, MS-Excel Screen and Its Components, Features of Excel, Elementary Working with MS-Excel, Manipulation of cells, Formatting of Spreadsheet and Cells, Formulas and Functions, Spread sheets for Small accountings, Previewing and Printing a Worksheet.
Power-point: Introduction to MS-PowerPoint, Starting MS-PowerPoint, Basics of PowerPoint, MS PowerPoint Screen and Its Components, Features of PowerPoint, Elementary, Elementary Working with MS-PowerPoint, Preparation of Slides, Creation of Presentation, Providing aesthetics, Slide Manipulation and Slide Show, Presentation of the Slides.

UNIT V Computer Communication and Internet:

Computers and Communication: Introduction to Computer Networks, Internet and World Wide Web, Communication and Collaboration(Electronic Mail), Basic of electronic mail, Web Browsers and Servers, Introduction to HTML, Use of Computer in Commerce,

Internet Applications, Electronic Data Interchange, Electronic Payment System, Internet Security, Privacy, Ethical Issues & Cyber Law.

Text Books:

1. E Balagurusamy , “Fundamentals of Computers ”,TMH 2009.
2. Silakari and Shukla, “Basic Computer Engineering ”, Wiley India 2011.
3. V. Rajaraman, Neeharika Adabala, “Fundamentals of Computers”, Sixth edition PHI 2015
4. Ajoy Kumar Ray and Tinku Acharya ,“ Basic Computer Engineering”, PHI 2011.
5. P K Sinha ,“Fundamentals of Computers ” ,Fourth , BPB Publications, 2004. Reference

Books:

1. J. P. Tremblay and R.B. Bunt, “An Introduction of Computer Science –An Algorithmic Approach”,TMH 2015.
2. Faith Wempen , "Computing Fundamentals: Introduction to Computers ", Wiley 2015.
3. Norton, Peter, “Introduction to Computers”, Fourth revised ,Mc-Graw-Hill 2000.
4. Reema Thareja , “Fundamental of Computers”, Oxford University Press, 2014.

List of Practical:

1. Study and Perform different MS –DOS Commands (Internal and External).
2. Create the "test" directory in the directory you are currently in using MS-DOS.
3. Study of Word – Templates, Styles.
4. Create a new user and give it Administrator privilege for Microsoft windows OS.
5. Create a MS-Word .doc file contain your complete CV.
6. Study and perform different Excel Commands/Functions.
7. Perform MS-Excel Accounting.
8. Create a MS-Excel .xls file contain mark sheet.
9. Display the student's result into a chart using MS-Excel.
10. Create a MS-Power Point Presentation .ppt file covers the topic “Computer's Evolution”.
11. Create a MS-Power Point Presentation .ppt file covers the topic “social responsibility”.
12. Create a MS-Access database .mdb file to store the results of students.
13. Study of various Network topologies.

S.4 Computer Peripherals and Interfaces (BTCS-204)

UNIT I Memory:

Introduction to memory and its use, Memory chips and Modules: DIPP, SIPP, SIMM, DIMM, SO-DIMM, RIMM, Parity checking and ECC, ROM and its types, RAM and its types, Trouble shooting of Memory, Advanced Memory technologies: RDRAM, DDRAM, PRAM, VRAM.

UNIT II Motherboard:

Motherboard Controllers and System Resources, I/O System Bus: ISA, MCA, ELSA, VESA local bus, PCI, AGP, PCIX, Onboard I/O devices, Chipsets, ROM BIOS, ROM POST,

CMOS settings, Motherboard Form factor: AT and ATX Motherboard, LPX and NLX form factor.

UNIT III Power Supply:

Power Supply Functions and Operations, Power Supply Quality and Specifications, Power Supply and Form factors, Ventilation and Cooling: Fan, Processor cooling, Temperature limits, Power Problems and procedures, Power protection devices, Back-up power system.

UNIT IV Interfaces and I/O Ports:

Floppy Disk interface: Controller, Power cable, Control/Data cable, IDE interfaces: ATA standards, Master/Slave Configuration, Data transfer modes, SCSI interface: Bus, Standards, Hardware's, which is better SCSI or IDE, Serial ports, Parallel ports, USB, Troubleshooting.

UNIT V Device Drives and Peripherals:

Magnetic Storage: Reading/Writing, hard disk drives, Floppy disk drives, Optical Storage devices: CD-ROM drive, DVD-ROM drive, Keyboard: layouts, interfaces, Pointing devices, Mouse, Monitors, Printers, Troubleshooting of device drivers and peripherals.

Text Books:

1. Craig Zacker & John Rourtre, PC Hardware- The complete reference, First Edition, TMH, 2017
2. S.K. Chauhan, PC Upgrading, maintenance and troubleshooting guide, First Edition,
3. B. Govindarajalu, IBM PC and CLONES: Hardware, Troubleshooting and Maintenance McGraw Hill Education, 2nd Edition 2002
4. Mark Minasi, The Complete PC Upgrade and Maintenance Guide, Sixteenth edition Wiley, 2005
5. Mike Meyers, Introduction to PC Hardware and Troubleshooting, 1st edition, McGraw Hill Education, 2017

Reference Books:

1. Stephen Bigelow, Bigelow's Troubleshooting, Maintaining & Repairing PCs, 5 edition, McGraw Hill Education, 2017
2. Manahar Lotia, Pradeep Nair, Payal Lotia, Modern Computer Hardware Course, Second Revised Edition, BPB Publications, 2007
3. Vikas Gupta, Comdex Hardware and Networking Course Kit: Revised & Upgraded, Dreamtech Press, 2014
4. Dan Gookin, Troubleshooting and Maintaining Your PC All-in-One For Dummies, 3rd edition, John Wiley & Sons, 2017
5. Robert Bruce Thompson, Barbara Fritchman Thompson, Building the Perfect PC, 3 edition, O'Reilly, 2010

List of Practical:

1. To study and demonstrate the motherboard.
2. To study microprocessor and its types.
3. To study Back Power Supply: SMPS and UPS.

4. To study the Optical Drives: CD-ROM and DVD-ROM.
5. To study the working principle of keyboard and mouse.
6. To study different types ports and slots on board.
7. To study various types of Cables and their Connectors.
8. To study the working principle of monitor.
9. To study different types of printers.
10. To study the process of assembling a Motherboard.
11. To study working of Floppy Disk Drive.

S.5 Principles of 'C' language (BTCS-104)

UNIT I Introduction to Programming Languages:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals Of Algorithms, Flowcharts.

UNIT II Introduction to 'C' Language:

Character Set. Variables and Identifiers, Built-In Data Types. Variable Definition, Arithmetic Operators and Expressions, Constants And Literals, Simple Assignment Statement, Basic Input/Output Statement, Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement, Structured Programming.

UNIT III One Dimensional Arrays:

Array Manipulation; Searching, Insertion, Deletion of an Element from an Array; Finding the Largest/Smallest Element in an Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of a Square Matrix, Strings as Array of Characters, Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions And Pointers, Arrays And Pointers, Pointer Arrays.

UNIT IV Top-Down Approach of Problem Solving:

Modular Programming and Functions, Standard Library of C Functions, Prototype of a Function: Foolal Parameter List, Return Type, Function Call, Block Structure, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functionsand Arrays as Function Arguments Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

UNIT V Concept of Files:

File Opening in Various Modes and Closing of a File, Reading from a File, Writing onto a File.

Text Books:

1. Tennence W.Pratt, "Programming languages design and implementation", Prentice Hall of India.
2. Allen B. Tucker, "Programming Languages", Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH publications.
4. Balagurusamy,:"Programming with C++", ANSI C TMH

Reference Books:

1. Roosta- Foundation of Programming Languages,Vikas
2. Jeyapoovan- A First Course in Prog with C, Vikas 8. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
3. Fundamentals of Programming Languages, R. Bangia,Cyber Tech .
4. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB

S.6 Programming Skills with 'C' (BTCS-108)

Unit - 1 Introduction to Programming:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals of Algorithms, Flow Charts.

UNIT II Programming using C:

C data types, int, char, float etc, C Expressions, Arithmetic Operation, Relational and Logic Operations, C Assignment Statements, Extension of Assignment of The Operations, C Primitive Input Output Using getchar and putchar, Exposure to the scanf and printf functions, C Statements, conditional executing using if, else, Optionally Switch and Break Statements may be mentioned.

UNIT III Iterations and Subprograms:

Concept of loops, Example of Loops in C Using for, while and do-while, Optionally continue may be mentioned, One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations, Concept of Sub-programming, functions Example of functions, Argument passing mainly for the simple variables.

UNIT IV Pointers and Strings:

Pointers, Relationship Between Arrays and Pointers Argument passing using Pointers Array of Pointers, Passing arrays as Arguments, Strings and C String Library.Structure and Unions, Defining C structures, Passing Strings as Arguments Programming Examples.

Unit –V File handling:

Console Input Output Functions, Disk Input Output Functions, Data files, Command Line Arguments, Bitwise Operators, Enumerated Data Types, Type Casting, macros, The C Preprocessor, More About library Functions.

Reference Books:

1. E Balaguruswamy , Object Oriented Programming With C++ , 4th Edition , TMH, 2008
2. Brian W. Kernighan and Dennis M. Ritchie ,“The C Programming Language”, 2nd Edition, Prentice-Hall India, New Delhi, 2002
3. Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2000
4. H. Cooper and H. Mullish, Jaico Publishing House. “Spirit of C”, 4th Edition, Jaico Publishing House, 2006

List of Practical:

1. Write a program to produce ASCII equivalent of given number.
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user
 - I $(ax+b)/(ax-b)$
 - II $(x^5+10x^4+8x^3+4x+2)$
4. Write a program to find sum of a geometric series.
5. Write a program to cipher a string.
6. Write a program to check whether a given string follows English capitalization rules.
7. Write a program to find sum of the numerical series.
8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.
9. Write a recursive program for tower of Hanoi problem
10. The fibonacci sequence of numbers is 1,1,2,3,5,8..... Based on the recurrence relation
 - a. $F(n)=F(n-1)+F(n-2)$ for $n>2$
 - b. Write a recursive program to print the first m Fibonacci number
11. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
 - a) Addition of two matrices
 - b) Subtraction of two matrices
 - c) Finding upper and lower triangular matrices
 - d) Trace of a matrix
 - e) Transpose of a matrix
 - f) Check of matrix symmetry
 - g) Product of two matrices.
12. Write a program that takes two operands and one operator from the user perform the operation and then print the answer.
13. Write a program to print pyramid.
14. Write functions to add, subtract, multiply and divide two complex numbers $(x+iy)$ and $(a+ib)$ Also write the main program.
15. Write a program to copy one file to other, use command line arguments.
16. Write a program to mask some bit of a number (using bit operations).
17. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

What is HTML, HTML Documents, SGML, Basic structure of an HTML document, creating an HTML document, Headers tags, Body tags, Paragraphs formatting, Text Elements, Tag Elements, Special Character elements, Image tags, HTML Table tags and lists: Numbered list, Non- Numbered lists, Definition lists, Anchor tag, Name tag, Hyperlinks – FTP/HTTP/HTTPS, Links with images and buttons, Links to send email messages, Text fonts and styles, background colors/images, Marquee Behavior, Forms related tags. (Action, method, name, inputetc.)

UNIT II HTML5:

Introduction of HTML5, Browser supports, Migration from HTML4 to HTML5, New Elements in HTML5, HTML5 different parts layout of a web page, HTML5 Graphics: Canvas, SVG, HTML Media Tags: Inserting audio files, Inserting video files, Screen control attributes, Media control attributes, HTML Object.

UNIT III CSS:

Introduction of CSS, CSS Syntax CSS Id & Class. CSS Styling: styling Backgrounds, styling Text, styling Fonts, styling Links, styling Lists, styling Tables. CSS Box Model: Border, Outline, Margin, Padding. CSS Advanced: Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image capacity, Image Sprites, Media Types, and Attribute Selectors.

UNIT IV XML:

Introduction of XML, Cross scripting of XML, XML as intermediate language, Difference between XML and HTML, XML DOM, Tree, Syntax, Elements, Attributes, Namespaces, XPath, XML DTD, Applications, XQuery, XML Schema, XML Parser, XHTML: Introduction of XHTML, XHTML rules over the HTML, conversion HTML to XHTML.

UNIT V Java Script:

Introduction to client side scripting, Server side scripting, Java Script Syntax, Variables and Functions, Operators: JavaScript Arithmetic Operators, JavaScript Assignment Operators, JavaScript Popup Boxes, JavaScript Window, Events and Objects, JavaScript Function Call, Validation in webpages, Introduction of AJAX

Text Books:

1. Jennifer Niederst Robbins. Learning Web Design, Fifth Edition, O'Reilly Media, Inc, May 2018.
2. Frain and Ben. Responsive Web Design with HTML5 and CSS3, Second Edition, 2015.
3. Nicholas c.Zakas. Java Script for Web Developers, Third edition, 2012.
4. George Q. Huang, K. L Mak. Internet Applications in Product Design and Manufacturing, ISBN: 3540434658, 2003 edition, springer, 2012.

Reference Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible", Fifth Edition, WileyIndia, 2010.

2. John Duckett,"Beginning HTML, XHTML, CSS, and JavaScript ",WileyIndia, 2010.
3. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design",3rd edition, Wiley India, 2011.
4. Achyut S. Godbole, Atul Kahate, Web Technologies, ISBN: 9781259062681,3rd edition, TMH, 2013.

List of Practical:

1. Design a Web Page, Insert an image on to the web page such that image is of height 300 and width 300 pixels. The image should have an ALT text in it.
2. Create a Web page that holds a bulleted list of the names of your friends. Make sure that the bullets are in plain circle.
3. Create a Frame which would hold both the web page that was created earlier. The frame should be split row-wise into equal halves.
4. Create a Web Page to display the marks you got in all subjects of last semester using table.
5. Create a Form having two boxes with labels as First Name and Last Name. The User should not be allowed to enter the names directly in the text boxes. The input has to be given in the prompt box and then entered values should be given in the textboxes.
6. Create a Web Page that has a button in the center of the page. Using mouse events change the Message in the statusbar.
7. Design a Web page that accepts Username and Password. Opens a new window when the password corresponds to a particular value is set by the developer
8. Design a Web page that consists of 2 text boxes. When the page is first loaded set the focus to the first textbox. The user should not be allowed to leave the box unless enters a value in it.
9. To convert the HTML code to XHTML code.
10. To study the XML tree.
11. To study of Dreamweaver Tool.
12. To study of a Flash Animation Tool.

- Sem 2

S.1 Mathematics-II (BTMACS-201)

UNIT I Calculus of Matrices:

Systems of linear equations and their solutions. Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices.

UNIT II Differential Equation:

Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

UNIT III Numerical Analysis Interpolation and Curve Fitting:

Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton-Gregory Polynomial Form; Lagrange Polynomial Interpolation; Approximation by Least Square Method. Numerical Differentiation and Integration:

Discrete Approximation of Derivatives: Forward and Backward Difference Forms, Numerical Integration, Simple Newton-Cotes Rules: Trapezoidal and Simpson's (1/3) Rules; Weddle's Rule.

UNIT IV Numerical Solution of ODE:

Euler's Method for Numerical Solution of ODE; Modified Euler's Method; Runge-Kutta Method (RK2, RK4); Multistep Method: Predictor-Corrector method.

UNIT V Probability Theory and Random Process:

Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, Poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains.

Text Books:

1. G. Strang, Linear Algebra And Its Applications, 4th Edition, Brooks/Cole, 2006
2. S. L. Ross, Differential Equations, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 7th Edition, Wiley, 2001.
5. K. E. Atkinson, Numerical Analysis, John Wiley, Low Price Edition (2004).
6. S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 2005.
7. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley, 2005.
2. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.
3. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
4. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.
5. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, 2001.
6. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
7. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill 2008.

S.2 Digital Logic and Circuit Design(BTEC-104)

UNIT I Number System & Codes:

Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1's Complement & 2 's Complement

representation and their arithmetic operation, Floating point representation, binary codes, BCD,ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II Boolean algebra and Logic gates:

Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan's theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / Quine McCluskey method.

UNIT III Combinational logic:

Arithmetic circuits- Half adder, Full adder, Halfsubtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

UNIT IV Sequential logic:

Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V Semiconductor Memories and A/D and D/A converters:

Semiconductor Memory – RAM, ROM Organization, operation and their Types, PLD-PAL, PLA, PROM, FPGA, Analog to Digital (A/D)and Digital to Analog (D/A) converters and their types

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. S Salivahanan and S Arivazhagan: Digital Circuits and Design, 4th Edition, Vikas Publishing House, 2012.

Reference Books:

- A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI, 2016.
1. Floyd and Jain, "Digital Fundamentals", 10th Edition, Pearson Education India, 2011.
2. Roland J.Tocci,Widmer,Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson 2009.
6. Stephen Brown, ZvankoVranesic, "Fundamentals of Digital Logic Design", 3rd Edition, McGraw Hill, 2017.

List of Practical:

1. To study and test of operation of all logic gates for various IC's (IC7400,IC7403,IC408,IC74332,IC7486).
2. Verification of DeMorgan's theorem.
3. To construct of half adder and full adder.
4. To construct of half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.

6. Verification of versatility of NOR gate.
7. Design a BCD to excess 3code converter.
8. Design a Multiplexer/ Demultiplexer
9. Analysis of various flip flops with Preset and Clear capability.
10. Design of Johnson and Ring counter.
11. Design of synchronous and asynchronous up/down counters.

S.3 Data Structure and Algorithms (BTCS-403)

UNIT I Introduction:

Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations. Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays. Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

UNIT II Linked List:

Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

UNIT III Stack:

The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi. The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV Tree:

Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion. Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V Sortings:

Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

Text books:

1. **Ashok N. Kamthane, “Introduction to Data structures”, 2nd Edition, Pearson Education India,2011.**
2. **Tremblay & Sorenson, “Introduction to Data- Structure with applications”, 8th Edition, Tata McGrawHill,2011.**
3. **Bhagat Singh & Thomas Naps, “Introduction to Data structure”, 2nd Edition, Tata McGrawHill 2009.**
4. **Robert Kruse, “Data Structures and Program Design”,2nd Edition,PHI,1997.**
5. **Lipschutz Seymour,”Data structures with C” ,1st Edition ,Mc- GrawHill,2017.**

Reference Books:

1. **Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.**
2. **ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.**
3. **E. Balagurusamy ,”Data Structure Using C” ,Tata McGraw-Hill 2017.**
4. **Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015**
5. **Gav Pai, Data Structures, Tata McGraw-Hill, 2015.**

List of Practical:

1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.
3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list
10. Program for implementation of Bubble sort
11. Program for Insertion sort
12. Program for Merge Sort
13. Program to implement Heap sort
14. Program to implement Quick sort
15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. To develop an algorithm for binary tree operations and implement the same.
17. To design an algorithm for sequential search, implement and test it.
18. To develop an algorithm for binary search and perform the same.

S.4 Computer System Organization (BTCS-404)

UNIT 1 Introduction for basic model of computer:

Brief History of computers, Von Newman architecture, Computer components, CPU, Memory, I/O, System Bus, registers, Program Counter, Accumulator, Register Transfer Language, Instruction Cycle, Instruction formats and addressing modes of basic computer. Basic arithmetic operations: addition, subtraction, multiplication, division, floating point arithmetic.

UNIT II Control Unit Organization:

Control unit operations - Address Sequencing & Micro operations, Hardwired control unit, Micro and Nano programmed control unit, Control Memory, Micro Instruction formats, Micro program sequencer, Microporgramming.

UNIT III Input Output Organization:

I/O Systems, Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, I/O processor, Introduction to 8085, 8085 I/O structure, 8085 instruction set and basic programming.

UNIT IV Memory organization:

Characteristics of Memory systems, Internal and External memories, Memory Hierarchy, High speed Memories: Cache Memory - Organization and mappings, Associative memory, Virtual memory: Segmentation, Paging, Address Translation Virtual to Physical. Secondary Storage: Magnetic Disk, Tape, DAT, RAID, Optical memory, CDROM, DVD.

UNIT V Multiprocessors:

Multiprocessor organization, Instruction level pipelining and Superscalar Processors , Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication, GPU.

Text Books:

- 1.Morris Mano, Computer System Architecture, Fourth edition, PHI, 2015.
- 2.Tanenbaum, Structured Computer Organization, First Edition, Pearson Education, 2016.
- 3.J P Hayes, Computer Architecture and Organizations, Third edition, Mc- Graw Hills, New Delhi, 2017

Reference Books:

- 1.Gaonkar, Microprocessor Architecture, Programming, Applications with 8085, fifth Edition, Prentice Hall, 2015.
- 2.William Stallings, Computer Organization and Architecture, Seventh Edition, PHI, 2009.
- 3.ISRD group, Computer Organization, Second edition, TMH, 2006.
- 4.Carter, Computer Architecture (Schaum), Third Edition, TMH, 2012.
- 5.Carl Hamacher, Computer Organization, Fifth Edition, TMH, 2002.

S.5 Object Oriented Programming (BTCS-305)

UNIT-I Introduction to OOP:

Abstract data types, Objects and classes, Attributes and Methods, Objects as software units, Encapsulation and Information hiding, Objects instantiations and interactions, Object lifetime, Static and dynamic objects, global and local objects, Metaclass, Modeling the real world objects.

UNIT-II Object and Classes:

Relationships between classes, Association of objects, Types of Association, Recursive Association, Multiplicities, Navigability, Named association, Aggregation of objects. Types of Aggregation, Delegation, Modeling Association and Aggregation.

UNIT-III OOP Concepts :

Inheritance and Polymorphism, Types of Polymorphism, Static and Dynamic Polymorphism, Operator And Method Overloading, Inherited Methods, Redefined Methods, The Protected Interface, Abstract Methods and Classes, Public and Protected Properties, Private Operations, Multiple Inheritance.

UNIT-IV I/O and File management:

Concept of Streams, Cin and Cout Objects, C++ Stream Classes, Unformatted and Formatted I/O, Manipulators, File Stream, C++ File Stream Classes, File Management Functions, File Modes, Binary And Random Files.

UNIT-V C++/Java:

Exception Handling , TypeCasting ,Templates function and class in C++, Comparison Between C++ and Java, Features of Java ,Introduction to java, Inheritance, Interface and Abstract class in Java.

TEXT BOOKS:

1. David Parsons; Object oriented programming with C++; Second edition; BPB publication; 1997.
2. Robert Lafore; Object oriented programming in C++ ; Fourth edition ; Pearson publication;2002 .
3. E Balagurusamy; Object oriented programming with C++; Seven edition; TMH; 2017.
4. Herbert Schildt ; Java Complete Reference;Seven edition; McGrawHill; 2006 .

REFERENCES:

- 1.John R Hubbard; Programming in C++ (Schaum); Third edition; TMH; 2000.
- 2.Venugopal; Mastering C++ ; second edition ;TMH; 2006.
- 3.Steven Holzner; C++ Programming Black Book; First Edition; Coriolis Group,U.S;2001.
- 4.E Balagurusamy; Programming with java a primer; Fourth edition; TMH ; 2011.

S.6 Programming Skills with 'C++' (BTCS-208)

UNIT I:

Object Oriented Programming: Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies.

UNIT II: Tokens, Expression and controls Structures:

Tokens , Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables. Operators in C++ : Scope resolution operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. Functions: The main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III: Class and Object:

Introduction, Specifying a Class, Defining Member Functions, C++ Program with Class, Nesting of Member functions, Private Member Functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructor and Destructor: Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, and Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor, Operator overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators.

UNIT IV: Inheritance and Polymorphisms:

Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT V: I/O Operations and Files:

C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put(), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good().

Text Books:

1. E Balagurusamy, Object Oriented Programming with C++, 7Th Edition, Mc Graw Hill India, 2017.
2. Robert Lafore, Object Oriented Programming In C++, 4Th Edition, 2001.
3. David Parsons, Object Oriented Programming with C++; BPB publication, 2008.
4. Hubbard, Programming in C++ (Schaum), 3rd Edition, McGraw Hill Education, 2009.

Reference Books:

1. Herbert Schildt, **The Complete Reference**, 4th Edition, Tata McGraw-Hill Education Pvt. Ltd.,2000.
2. K R Venugopal, **Mastering C++**, 2nd Edition, McGraw Hill Education, 2017.
3. Rajaram, R., **Object Oriented Programming and C++**, Second Edition, 2007
4. Saurav Sahay, **Object Oriented Programming with C++**, Oxford, 2006.

List of Practical:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76
2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.
3. Write a function using reference variables as arguments to swap the values of a pair of integers.
4. Write a macro that obtains the largest of 3 numbers.
5. Define a class to represent a bank account. Include the following members:

Data members

1. Name of the depositor
2. Account number
3. Type of account
4. Balance amount in the account

Member functions

1. To assign initial values
2. To deposit an amount
3. To withdraw an amount after checking the balance
4. To display name and balance

Write a main program to test the program.

7. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.
7. Design a constructor for bank account class.
8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message “Required copies not in stock” is displayed.

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.

9. Improve the system design in exercise 8 to incorporate the following features:

(a) The price of the books should be updated as and when required. Use a private member function to implement this.

(b) The stock value of each book should be automatically updated as soon as a transaction is completed.

(c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.

10. Design a C++ Class „Complex“ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

11. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class account that stores customer name, account number and type of account. From this derive the classes curacct and savacct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

- a) Accept deposit from a costumer and update the balance.
- b) Display the balance
- c) Compute and deposit interest.
- d) Permit withdrawal and update the balance.
- e) Check for the minimum balance, impose penalty, necessary and update balance.

12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it the derived class to suit their requirements.

S.7 Communication Skills (HUCS-101)

UNIT I Communication:

Nature, Meaning, Definition, Verbal and Non Verbal Communication Barriers to Communication.

UNIT II Basic Language Skills:

Grammar and usage- Parts of Speech, Tenses, S-V Agreement, Preposition, Article.

UNIT III Basic Language Skills:

Types of Sentence, Direct - Indirect, Active - Passive voice, Phrases& Clauses. UNIT IV Business Correspondence: Business Letter, Parts & Layouts of Business Resume and Job application, E-mail writing.

UNIT V Report Writing:

Importance of Report, Types of Report, Structure of a Report.

Text & Reference Books:

1. Ashraf Rizvi.(2005).Effective Technical Communication. New Delhi: Tata McGraw Hill
2. Adair, John (2003). Effective Communication. London: Pan Macmillan Ltd.
3. A.J.Thomson and A.V.Martinet(1991).A Practical English Grammar(4th ed). New York: Oxford IBH Pub.
4. Kratz, Abby Robinson (1995). Effective Listening Skills. Toronto: ON: Irwin Professional Publishing.
5. Prasad, H. M. (2001) How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill.
6. Pease, Allan. (1998). Body Language. Delhi: Sudha Publications.

List of Practical:

1. Self-Introduction
2. Reading Skills and Listening Skills
3. Oral Presentation
4. Linguistics and Phonetics
5. JAM (Just a Minute)
6. Group Discussion

- Sem 3

S.1 Discrete Structures (BTIT-401)

UNIT I Set Theory:

Definition Of Sets, Venn Diagrams, Complements, Cartesian Products, Power Sets, Counting Principle, Cardinality and Countability (Countable And Uncountable Sets), Proofs of Some General Identities on Sets, Pigeonhole Principle. Relation: Definition, Types of Relation, Composition of Relations, Domain and Range of a Relation, Pictorial Representation of Relation, Properties of Relation, Partial Ordering Relation. Function: Definition and Types of Function, Composition of Functions, Recursively Defined Functions.

UNIT II Propositional Logic:

Proposition Logic, Basic Logic, Logical Connectives, Truth Tables, Tautologies, Contradiction, Normal Forms (Conjunctive and Disjunctive), Modus Ponens and Modus Tollens, Validity, Predicate Logic, Universal and Existential Quantification. Notion of Proof: Proof by Implication, Converse, Inverse, Contrapositive, Negation, and Contradiction, Direct Proof, Proof by Using Truth Table, Proof by Counter Example

UNIT III Graph Theory:

Terminology Graph Representation Graph Isomorphism; Connectedness; Various Graph Properties; Euler and Hamiltonian Graph; Shortest Paths Algorithms. Trees: Terminology, Tree Traversals; Prefix Codes, Spanning Trees, Minimum Spanning Trees.

UNIT IV Algebraic Structure:

Binary Composition and its Properties Definition of Algebraic Structure; Groyas Semi Group, Monoid Groups, Abelian Group, Properties of Groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (Definition and Standard Results).

UNIT V Posets, Hasse Diagram And Lattices:

Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded and Complemented Lattices. Combinatorics: Introduction, Permutation and Combination, Binomial Theorem, Multinomial Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive Algorithms, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions, Generating Functions, Solution by Method of Generating Functions.

Text Books:

1. C.L.Liu, “Elements of Discrete Mathematics”, 4th Edition, Tata McGraw-Hill, 2012.
2. Kenneth H. Rosen, “Discrete Mathematics and its applications”, 7th Edition, Tata McGraw-Hill, 2012.
3. V. Krishnamurthy, “Combinatorics: Theory and Applications”, 2nd Edition, East-West Press, 2008.
4. Seymour Lipschutz, M. Lipson, “Discrete Mathematics”, 3rd Edition, Tata McGraw Hill, 2009.

Reference Books:

1. Trembley, J.P & Manohar; “Discrete Mathematical Structure with Application CS”, Tata McGraw Hill.
2. Bisht, “Discrete Mathematics”, Oxford University Press, 2015.
3. Biswal, “Discrete Mathematics & Graph Theory”, 3rd Edition, PHI, 2011.

S.2 Data Communication (BTCS-302)

UNIT I Introduction:

Data Communication Components, Types of Connections, Transmission Modes, Network Devices, Topologies, Protocols and Standards, OSI Model, Transmission Media, Bandwidth, Bit Rate, Bit Length, Baseband and Broadband Transmission, Attenuation, Distortion, Noise, Throughout, Delay and Jitter.

UNIT II Data Encoding:

Unipolar, Polar, Bipolar, Line and Block Codes. Multiplexing: Introduction and History, FDM, TDM, WDM, Synchronous and Statistical TDM. Synchronous and Asynchronous transmission, Serial and Parallel Transmission.

UNIT III Error Detection & Correction:

Correction, Introduction–Block Coding—Hamming Distance, CRC, Flow Control and Error Control, Stop and Wait, Error Detection and Error Go Back– N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, CSMA/CD, CDMA/CA

UNIT IV Network Switching Techniques:

Circuit, Message, Packet and Hybrid Switching Techniques. X.25, ISDN. Logical Addressing, Ipv4, Ipv6, Address Mapping, ARP, RARP, BOOTP and DHCP, User Datagram Protocol, Transmission Control Protocol, SCTP.

UNIT V Application Layer Protocols:

Domain Name Service Protocol, File Transfer Protocol, TELNET, WWW and Hyper Text Transfer Protocol, Simple Network Management Protocol, Simple Mail Transfer Protocol, Post Office Protocol v3.

Text books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw Hill, 2011.

Reference Books:

1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Fifth Edition, Elsevier, 2012.
2. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.
3. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

S.3 Analysis and Design of Algorithms (BTIT-305)

UNIT 1 Algorithms Designing:

Algorithms, Analyzing Algorithms, Asymptotic Notations, Heap and Heap Sort, Brief Review of Graphs, Sets and Disjoint Set Union, Sorting and Searching Algorithms and their Analysis in terms of Space and Time Complexity. Divide and Conquer: General Method, Binary Search, Merge Sort, Quick Sort, Selection Sort, Strassen’s Matrix Multiplication Algorithms.

UNIT II Greedy Method:

General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths. UNIT III Dynamic Programming: General Method, Optimal Binary Search Trees, O/1 Knapsack, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV Backtracking:

General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets. Branch and Bound: Method, O/1 Knapsack Problem, Traveling Salesperson Problem, Efficiency Considerations, Techniques for Algebraic Problems, Some Lower Bounds on Parallel Computations.

UNIT V NP Hard and NP Complete Problems:

Basic Concepts, Cook's Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamental of Computer Algorithms", 2nd Edition, Galgotia Publication, 2001.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest "Introduction to Algorithms", 3rd Edition, MIT Press. 2009.
3. Donald E Knuth, "Fundamentals of Algorithms: The Art of Computer Programming" Vol I, 3rd Edition, Pearson Education, 1997.

Reference Books:

1. Goodman, S.E. & Hedetniemi, "Introduction to Design and Analysis of Algorithm", Tata McGraw Hill, 1977.
2. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms", Tata McGraw Hill, 2006.
3. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms" TMH Publication.
4. Michael T Goodrich and Roberto Tamassia "Algorithm Design", Wiley India.

List of Practical:

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for minimum spanning trees using Kruskal's algorithm.
6. Write a program for minimum spanning trees using Prim's algorithm.
7. Write a program for single sources shortest path algorithm.
8. Write a program for Floyd-Warshall algorithm.

9. Write a program for traveling salesman problem.
10. Write a program for Hamiltonian cycle problem.

S.4 Cyber Ethics and Social Media Analysis(ICS) (BTICS-301)

UNIT I Cyber Laws:

Introduction to the Legal Perspectives of Cybercrimes and Cyber security, Cybercrime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Cybercrime and Punishment, Cyber law, Technology and Students: Indian Scenario.

UNIT II Cyber Ethics and Cyber –

Crime Case Study: Ethics, Legal Developments, Cyber security in Society, Security in cyber laws case studies, General Law and Cyber Law-a Swift Analysis. Private ordering solutions,

Regulation and Jurisdiction for global Cyber security, Copy Right source of risks, Pirates, Internet Infringement, Fair Use, Postings, and Criminal Liability.

UNIT III Social Media and Network Analysis:

Phenomenology of Social Media, Network Analysis Types of Networks: General Random Networks, Small World Networks, Scale-Free Networks; Examples of Information Networks; Network Centrality Measures; Strong and Weak ties. Influence and Centrality in Social Networks. Basic of Sentiment Analysis.

UNIT IV Social Media Behavior:

Social Ties and Information Diffusion. Social Ties and Link Prediction, Social Network Analysis and online social networks -Concepts: How Services such as Facebook, LinkedIn, Twitter, Couch Surfing, etc. are using SNA to understand their users and improve their functionality.

UNIT V Security and Privacy in Social Network:

Privacy in a Networked World, Social Spam and Malicious Behavior, Sybil attack, distributed denial of service attack, Leakage and Linkage of user information and content, predicting the future with social media, Friendship paradox and detection of contagions.

Text Books:

1. Sunit Belapure and Nina Godbole, **Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives**, Wiley India Pvt. Ltd, 2011.
2. John Scott, **Social Network Analysis**, 3rd Edition, SAGE, 2012.
3. Wouter de Nooy, Andrej Mrvar, Vladimir Batagelj, **Exploratory Social Network Analysis with Pajek**, 2nd Revised Edition, Cambridge University Press, 2011
4. Patrick Doreian, Frans Stokman, **Evolution of Social Networks**, Routledge, 2013.

Reference:

1. Mark F Grady, Francesco Parisi, “The Law and Economics of Cyber Security”, Cambridge University Press, 2006
2. Jonathan Rosener, “Cyber Law: The law of the Internet”, Springer-Verlag, 1997.
3. David Easley and Jon Kleinberg, **Networks, Crowds, and Markets: Reasoning About a Highly Connected World**, Cambridge University Press, 2010.
4. A. Anagnostopoulos, R. Kumar, M. Mahdian, 2008 “Influence and correlation in social networks”, In Proceeding of the 14th ACM SIGKDD international conference on Knowledge discovery and data mining, pp. 7-15.
5. E Bakshy, J. M. Hofman, W. A. Mason, D. J. Watts. 2011 “Everyone's an influencer: quantifying influence on Twitter” In Proceedings of Int. Conf. on Web Search and Data Mining (WSDM).

List of Practical:

1. Case study of current IT act related cases.
2. Case study of Cyber Crimes.
3. Case study of IT law related real life examples.
4. Practical analysis of Social Networking sites.
5. Practical analysis of Networks.
6. Finding out the vulnerable data on Social Networking sites.
7. Find out attacks on Social networking sites.

- 8. Practical analysis of Malwares in Social Networking sites.**
- 9. Case study of Social Networking related crimes**

S.5 Introduction to Core Java (BTIT-309)

UNIT I The Java Environment:

Basic History of Java and its Features, JVM, JRE and JDK, its Libraries and Functionalities, Why Java? Installing Java, Java Classes and Objects, Variables and Data Types Conditional and Looping Constructs, Arrays.

UNIT II The Java Language:

Constructors, Inheritance, Packages and Interfaces, Access Specifier, Enumerations, Auto boxing, and Annotations (Metadata) Garbage collection, Nested Classes, Inner Classes

UNIT III Performance:

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, The Idea Behind Exception, Exceptions and Errors, Types of Exception, Control Flow in Exceptions, JVM Reaction to Exceptions, Use of Try, Catch, Finally, Throw, Throws in Exception Handling, In-Built and User Defined Exceptions, Checked and Un Checked Exceptions, Generics, Lambda Expressions.

UNIT IV The Java Library:

String Handling, Exploring Java.Lang, Java.Util – The Collection Framework, Exploring Java.IO, Exploring Java. NIO.

UNIT V Database Connectivity with JDBC:

Introduction to JDBC, JDBC Drivers & Architecture, CRUD Operation using JDBC

Text Books:

- 1. Kishore Sharan, “Beginning Java 8 Language Features”, Apress, 2014**
- 2. E. Balagurusamy, “Programming with java A Primer”, Fourth Edition, Tata McGraw Hill, 2009.**
- 3. Sharanam Shah, “Core Java 8 for Beginners”, Shroff Publisher, 2015.**

Reference Books:

- 1. Herbert Schildt, “The Complete Reference Java”, Ninth Edition, McGraw Hill, 2014**
- 2. Bert Bates, Kathy Sierra, “Head First Java”, 2nd Edition, O’ Reilly, 2005**
- 3. Cay S Horstman and Gary Cornell, “Core Java”, Vol I & II, Pearson Education, 2013**

List of Practical:

- 1. Write a program to show concept of Class in Java?**
- 2. Write a program showing Type Casting**
- 3. Write a program showing Different type of inheritance**
- 4. Write a program showing Different types of Polymorphism**
- 5. Write a program showing Encapsulation**
- 6. Write a program showing Abstraction**

7. Write a Multithreaded program
8. Write a program showing Checked and Unchecked Exception
9. Write a program showing Database connectivity.
10. Write a program showing Simple database Operation (CRUD)

S.6 Technical Presentation Skills (BTCS-610)

COURSE OUTCOMES

Upon completion of the subject, students will be able to:

1. Ability to review, prepare and present technological developments.
2. Ability to face the placement interviews.
3. Ability to effectively communicate technical material in print.
4. Ability to present technical material orally with confidence and poise.
5. Ability to present technical material using audiovisual materials.
6. Ability to communicate technical material to a variety of audiences, from members of the building and engineering trades and medical fields to government representatives and the general public.
7. Ability to work well in teams.

TEXT BOOKS:

1. The Chicago Manual of Style, 13th Edition, Prentice Hall of India 1989.
2. Gowers Ernest, "The Complete Plan in Words" Penguin, 1973.
3. Menzel D.H., Jones H.M, Boyd, LG., "Writing a Technical Paper". McGraw Hill, 1961.
4. Strunk, W., & White E.B., "The Elements of Style", 3rd Edition , McMillan, 1979.

REFERENCES:

1. Turbian K.L., "A Manual for Writers of Term Papers, Thesis and dissertations" Univ of Chicago Press, 1973.
2. IEEE Transactions on "Written and Oral Communication" has many papers.

S.7 Web Development Lab-II (PHP/JSP) (BTIT-407)

UNIT-I Introduction to PHP:

Identify Relationship Between Apache, Mysql and PHP, Steps to Install and Test Web Server, Configure Apache to Use PHP, Create Simple PHP Page Using PHP Structure and Syntax, Use of PHP Variables, Data Types and PHP Operators, Apply Control Structures in Programming, Steps to Create User Defined Functions.

UNIT-II Working with in Built Functions:

Apply Various Inbuilt variable (Gettype, Settype, Isset, Strval, Floatval, Intval, Print_R), String(Chr, Ord, Strtolower, Strtoupeer, Strlen, Ltrim, Rtrim, Trim, Substr, Strem, Strcasecmp, Ctrops, Strops, Stristr, Str_Replace, Strrev, Echo, Print), Math(Abs, Ceil, Floor, Round, Fmod, Min, Max, Pow, Sqrt, Rand), Date (Date, Getdate, Setdate, Checkdate, Time, Mktime), Array(Count, List, In_Array, Current, Next, Previous, End, Each, Sort, Array_Merge, Array_Reverse), File Functions (Fopen, Fread, Fwrite, Fclose) in Programming .

UNIT-III: Working With Data And Forms:

Steps to Create an Input Form (Text Fields, Text Areas, Check Boxes, Radio Buttons, List Boxes, Password Controls, Hidden Controls, Image Maps, File Uploads, Buttons), Steps to Use Using PHP\$_Get And \$_Post, \$_Request Method for a Given Application, Combining HTML and PHP Codes Together on Single Page, Redirecting the User.

UNIT-IV: Session, Cookies And Error Handling:

Use Cookie to Store and Retrieve Data, Use Querystring to Transfer Data, Create Session Variable and Handle Session, Starting and Destroying Session Working with Session Variables, Passing Session IDs, Handle Runtime Errors Through Exception Handling, Error Types in PHP. Database Connectivity Using MYSQL: Concepts and Installation Of Mysql, Mysql Structure and Syntax, Types of Mysql Tables and Storage Engines, Mysql Commands, Integration of PHP with Mysql, Connection to the Mysql Database, Creating And Deleting Mysql Database Using PHP, Updating, Inserting, Deleting Records in the Mysql Database, Hosting Website (Using "C" Panel, Using FileZilla Software)

UNIT-V: Java Server Pages Basics:

Integrating Scripts in JSP, JSP Objects and Components, Configuration and Troubleshooting, JSP: Request and Response Objects, Retrieving the Contents of An HTML Form, Retrieving a Query String, Working with Beans, Cookies, Creating and Reading Cookies. Using Application Objects and Event Handling.

Text Books:

1. W. Jason Gilmore, "Beginning PHP and MySQL", 4th Edition, Apress, 2010
2. Steven Holzner, "PHP: The Complete Reference", Tata McGraw-Hill, 2008
3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", Third Edition, O'reillyMedia, 2014

Reference Books:

1. Julie C. Meloni, "Teach yourself PHP, MySQL and Apache All in one", 5th Edition, Pearson Education, 2012
2. Phil Hanna, "JSP 2.0: The Complete Reference", Tata McGrawHill, 2011.

List of Practical's:

1. Write a PHP script to display Welcome message.
2. Write a PHP script to demonstrate arithmetic operators, comparison operator, and logical operator.
3. Write PHP Script to print Fibonacci series.
4. Write PHP script to demonstrate Variable function
5. Write PHP script to demonstrate string function.
6. Write PHP script to demonstrate Array functions.
7. Create student registration form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.
8. Write two different PHP script to demonstrate passing variables through a URL.
9. Write PHP script to demonstrate passing variables with cookies.
10. Write an example of Error-handling using exceptions.
11. Write a PHP script to connect MySQL server from your website.
12. Write a program to read customer information like cust_no, cust_name, item_purchase,

and mob_no, from customer table and display all these information intable format on output screen.

13. Write a program to read employee information like emp_no, emp_name, designationand salary from EMP table and display all this information using table format. 14. Create a dynamic web site using PHP and MySQL.

15. Write a program for JSP scriptlet tag that prints the user name

16. Write a program for JSP expression tag that prints current time

17. Write a program for JSP declaration tag that declares method

18. Write a program for JSP for request and response implicit object

19. Write a program for JSP for session implicit object

20. Write a program for JSP for exception implicit object

21. Write a program for JSP for Simple example of java bean class

22. Write a program for JSP for JSP Action Tags

- Sem 4

S.1 Environment and Energy Studies (ML-301)

UNIT I Environmental Pollution and Control Technologies:

Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and industrial pollution, Ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid Waste management composition and characteristics of e - Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, Secondary and Tertiary.

UNIT II Natural Resources: Classification of Resources:

Living and Non - Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problem, Mineral resources: use and exploitation, environmental effects of extracting and using mineral resouces, Land resources: Forest resources, Energy resources: growing energy needs, renewable energy source, case studies.

UNIT III Ecosystems:

Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Energy flow in the ecosystem, Biogeochemical cycles, Bioaccumulation, ecosystem value, devices and carrying capacity, Field visits.

UNIT IV Biodiversity and its Conservation:

Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, manwildlife conflicts; Conservation of biodiversity: In-situ and Exsitu conservation. National biodiversity act.

UNIT V Environmental Policy, Legislation & EIA:

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP).

Text Books:

1. Agarwal, K.C.,(latest edition).Environmental Biology, Bikaner :Nidi Pub. Ltd.
2. Brunner R.C.(latest edition) Hazardous Waste Incineration, McGraw Hill Inc.
3. Clank R.S. ,,(latest edition. Marine Pollution, Clanderson Press Oxford (TB).
4. De A.K(latest edition) Environmental Chemistry, Wiley Western Ltd.
5. ErachBharucha(2005).Environmental Studies for Undergraduate Courses by for University Grants Commission.

Reference Books:

1. R. Rajagopalan(2006).Environmental Studies. Oxford University Press.
2. M. AnjiReddy(2006).Textbook of Environmental Sciences and Technology. BS Publication.
3. Richard T. Wright(2008).Enviromental Science: towards a sustainable future PHL Learning Private Ltd. New Delhi.
4. Gilbert M. Masters and Wendell P. Ela.(2008).Environmental Engineering and science. PHI Learning Pvt Ltd.
5. Daniel B. Botkin& Edwards A. Keller(2008).Environmental Science Wiley INDIA edition.
6. AnubhaKaushik(2009).EnviromentalStudies. New age international publishers.

S.2 Computer Networks(BTIT-502)

UNIT I Computer Network:

Definitions, Goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, TCP/IP model overview, Descriptions of various layers and its comparison with TCP/IP. Network standardization.

UNIT II Data Link Layer:

Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB.

UNIT III MAC Sublayer:

Overview of MAC Layer, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11 wireless Communication.

UNIT IV Network Layer:

Need, Services Provided, Design issues, Routing and congestion in network layer, wired & wireless routing protocol examples, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multi

cast Routing, IP protocol, IP Addresses, subnetting, Comparative study of IPv4 & IPv6, Mobile IP.

UNIT V Transport Layer:

Overview, Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Session layer: Overview, Authentication, Session layer protocol. Presentation layer: Overview, Data conversion, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler). Application Layer: Overview, WWW and HTTP, FTP, SSH.

Text Books:

1. Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.
2. Behrouz A. Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
3. William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
4. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
5. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

Reference Books:

1. Kaveh Pahlavan, Prashant Krishnamurthy, Networking Fundamentals, Wiley Publication, 2009.
2. Michael A. Gallo & William M. Hancock, Computer Communications & Networking Technologies, Cengagepearson publications, 2001.
3. Dimitri Bertsekas, Robert Gallager, Data Networks, PHI Publication, Second Edition, 1992.
4. Ulysses Black, Computer Networks, PHI Publication, Second Edition, 1993.

List of Practical:

1. Demonstrate Different Types of Network Equipment's.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.
4. Experiment with basic network command and Network configuration commands.
5. Examine network IP.
6. Write a program to implement various types of error correcting techniques.
7. Write a program to implement various types of farming methods.
8. Implement & simulate various types of routing algorithm.
9. Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
10. Simulate STOP AND WAIT Protocols on NS-2.
11. Simulate various Routing Protocol on NS-2.
12. Simulate various Network Topologies on NS-2.
13. Configuring routers, bridges and switches and gateway on NS-2.

S.3 Operating Systems (BTCS-502)

UNIT I Introduction to Operating System:

Introduction and Need of operating system, Layered Architecture/Logical Structure of Operating system, Type of OS(Multiprogramming , Time Sharing, Real Time ,Networked, Distributed, Clustered, Hand Held), Operating system as Resource Manager and Virtual Machine, OS Services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader. Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

UNIT II Process Management:

Process Model, Creation, Termination, States & Transitions, Hierarchy, Context Switching, Process Implementation, Process Control Block, Basic System calls- Linux & Windows. Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling

UNIT III Interprocess Communication:

Introduction to Message Passing, Race Condition, Critical Section Problem, Peterson's Solution, Semaphore, Classical Problems of Synchronization Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Sleeping Barber Problem etc. Deadlock- System model, Resource types, Deadlock Problem, Deadlock Characterization, Methods for Deadlock Handling, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock Detection, Recovery from Deadlock.

UNIT IV Memory Management:

concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit and quick fit. Free space management- bitmap, link list/free list. Virtual Memory- concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging ,working set model, page fault frequency, thrashing, page replacement algorithms- optimal, FIFO, LRU; Belady's anomaly; TLB (translation look aside buffer).

UNIT V File Management:

Concepts, Naming, Attributes, Operations, Types, Structure, File Organization & Access (Sequential, Direct ,Index Sequential) Methods, Memory Mapped Files, Directory Structures One Level, Two Level, Hierarchical/Tree, Acyclic Graph, General Graph, File System Mounting, File Sharing, Path Name, Directory Operations, Overview Of File System in Linux & Windows. Input/output Subsystems- Concepts, Functions/Goals, Input/Output devices- Block And Character, Spooling, Disk Structure & Operation, Disk Attachment, Disk Storage Capacity, Disk Scheduling Algorithm- FCFS, SSTF, Scan Scheduling, C-Scan Schedule.

Text books:

1. Abraham Silberschatz,"Operating system concepts",10th Edition,John Wiley & Sons. INC, 2018
2. Andrew S.Tannanbaum, "Modern operating system", 4th Edition,Pearson Education, 2014
3. Dhananjay M. Dhamdhere, "Operating Systems:A concept Based Approach", 3rd Edition TMH, 2017,

4. SibsankarHaldar, Alex AlagarsamyAravind,"Operating System", 8 th Edition, Pearson Education India,, 2010

Reference Books:

1. Achyut S Godbole,"Operating System",3rd TMH,2017.
2. William Stalling, "operating system" 8th, Pearson Education, ,2014.
3. Vijay Shukla, "Operating System", 3rd, Kataria&Sons ,2013.
4. Singhal&Shivratri,"Advanced Concept in Operating Systems", 1st , TataMc-Graw Hill Education, edition 2017.

List of Practical:

- 1. Implement and update the BIOS settings of your PC.**
- 2. If there are 5 printers are connected in a system each process to print will take different time to complete, and CPU will give a fixed time to each process after that deadline next process will enter in CPU. If a problem not completed in a given slot then that process will be reenter as per the FCFS, on rotation basis? Apply the scheduling on this?**
- 3. Implement Non Preemptive Priority CPU Scheduling.**
- 4. Implement Non Preemptive Shortest Job first CPU Scheduling.**
- 5. If there are 5 different resources like 3 printer,2 scanner are connected to a system each taking different time to complete the task. Which scheduling is best and gives best performance of CPU?**
- 6. Implement the scheduling for that where CPU give chance to complete those process first which comes first?**
- 7. Implement Round-Robin CPU scheduling.**
- 8. Write a program to implement Semaphore.**
- 9. Find the solution for the situation where 5 faculties are sitting in a round table. There are 4 ball pens are placed on this table. At a time only one pen can be picked by one faculty to writing work. What will happen if all picked the pen for writing simultaneously?**
- 10. Find the solution for dentist checkup clinic where only one chair and one dentist is available for treatment. And having n chairs to waiting for patient.**
 - If there is no patient, then the doctor sleeps in his own chair.
 - When a patient arrives, he has to wake up the doctor.
 - If there are many patients and the doctor is doing treatment of him, then the remaining patients either wait if there are empty chairs in the waiting room or they leave if no chairs are empty.
- 11. Write a program for Memory Management Algorithms e.g. First Fit, Best Fit, Worst Fit.**
- 12. Demonstrate Virtual memory Techniques like, LRU, FIFO etc.**
- 13. Implement Shortest Seek Time First Disk Scheduling Algorithm.**
- 14. Implement Scan Scheduling Disk Scheduling Algorithm.**
- 15. Implement Circular Scan Disk Scheduling Algorithm.**
- 16. Implement Look Disk Scheduling Algorithm.**

S.4 Database Management Systems (BTCS-405)

UNIT I

Introduction:

Concept & Overview of DBMS, Purpose of Database Systems, Architecture of DBMS, Data Models and its type, Schema and Instances, Data Independence, DBA and its function.

Entity-Relationship Model:

Entities, Attributes and its types, Mapping Cardinalities, Keys, Entity Relationship Diagram, Weak entity set and Strong entity set and Extended E-R features (Generalization , Specialization, Aggregation) ,ER Diagram to Relational Table conversion.

UNIT-II

Relational Model:

Structure of Relational Databases, Relation , Characteristics of Relations, Domains, Tuples , Relational schema and instance, Relational Algebra, Relational Algebra Operations (select, project, join and its type, union, intersection, set difference, Cartesian product, rename, division), Extended Relational Algebra Operations (Generalized Projection , Aggregate Functions , Outer Join),

Relational Calculus:

types of relational calculus, tuple and domain oriented relational calculus, and its operation.

UNIT-III

Integrity Constraints:

Null Values, Domain Constraints, Entity Integrity Constraints Referential Integrity Constraints, Key constraints, Triggers.

Relational Database Design:

Functional Dependency, Inference rule, Different Anomalies in designing a Database. Normalization , Decomposition, Normal Forms (1NF, 2NF, 3NF, BoyceCodd Normal Form, Normalization using Multi-Valued Dependencies, 4NF, Join Dependency, 5NF), Canonical cover.

UNIT IV

Query Optimization:

Introduction, steps of optimization, various algorithms to implement select, project and join operations of relational algebra, optimization methods: heuristic based, cost estimation based.

Transaction Processing, Concurrency Control and Recovery Management:

Transaction Model properties, State Serializability, Lock base protocols, Two Phase Locking, Time Stamping Protocols for Concurrency Control, and Validation Based Protocol, Multiple Granularities, Granularity of Data Item. Multi version schemes, Recovery with Concurrent Transaction, Recovery technique based on Deferred Update and Immediate Update, Shadow Paging, Recovery in Multi Database System and Database Backup and Recovery from Catastrophic Failure.

UNIT V

Index structures:

Types of index (primary, secondary, clustering, partitioning, unique and non index), use and Purpose of index, searching via an index.

SQL: DDL, DML, DQL (column function and grouping, union, multiple queries, union all, sub-query using IN, NOT IN, HAVING, GROUP BY CLAUSE), DCL (grant, revoke), TCL (Commit, roll back, save point, set Transaction)

Distributed database:

Planning for distributed database, management-centralized and decentralized Back-up and recovery.

Text books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.GrawHill, 6th Edition,2015.
2. C J Date, “An Introduction to Database System”, Pearson Educations, 8th Edition, 2004.
3. Elmasri, Navathe, “Fundamentals of Database Systems”, Pearson Educations 7th Edition, 2016.
4. SeemaKedar, Database Management System, Technical Publications, 2009. 5.
- 5.Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.

Reference Books:

1. IBM Career Education- database management system.
2. Abraham Silberschatz and S Sudarshan “Database System Concepts” 6th Edition McGraw-Hill Education – Europe 2013.
3. Raghu Ramakrishnan and Johannes Gehrke “Database Management Systems” McGrawHill Education, 2003.
4. Kahate, Atul “Introduction to Database Management Systems”Pearson Education India, 2006.

List of Practical:

1. Design a Database and create required tables. For e.g. Bank, College Database.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for table and record handling like implementing INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements and DROP, ALTER statements.
4. Write the queries for Retrieving Data from a Database Using the WHERE clause , Using Logical Operators in the WHERE clause , Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions and Combining Tables Using JOINS.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT () .
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Display name, hire date of all employees using cursors.
10. Display details of first 5 highly paid employees using cursors.
11. Write a database trigger which fires if you try to insert, update, or delete after 7'o' clock.
12. Write a data base trigger, which acts just like primary key and does not allow duplicate values.
13. Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.
14. Write the query for creating the users and their role. Using GRANT and REVOKE operations

S.5 Advanced Java Programming (BTCS-409)

UNIT-I

J2EE Event Handling & GUI Design Event handling, AWT: Windows, Graphics, Text, AWT Controls, Layout Managers, and Menus, Images, GUI Programming with Swing, Exploring Swing, Swing Menu

UNIT-II

Java Servlet Overview, Servlet Interface, Request, Servlet context, response, Session, Dispatching request, Web Application

UNIT-III

JDBC Standard Extension 2.0 Introduction to databases (SQL ,No - SQL) Connecting to Databases – JDBC principles – Databases access – Interacting – Database search – Database support in Web applications MySQL , Model View Controller, JSP , HTML , CSS.

UNIT-IV

ORM and J2EE Frameworks: Introduction to Frameworks:- Struts, Spring basics, Spring AOP , Introduction to JavaScript and JQuery

UNIT-V

Advance J2EE Topic: JavaMail 1.2(Sending and Receiving Mail, Mail body design, different components), Java Messaging Service (JMS) 1.0.2 (Architecture, Programming Model, Connection, Session, Producer, Consumer), Java API for XML Parsing (JAXP) 1.1 (Introduction, Parsing and XML, when to use SAX)

TEXT BOOKS:

1. Arnold, Ken, James Gosling, and David Holmes. **The Java programming language**. Addison Wesley Professional, 2005.
2. Keogh, James. "The Complete Reference J2ME." published by McGrawHill OSBORNE Edition (2003)..
3. Allamaraju, Subrahmanyam, et al. "Professional Java Server Programming J2EE 1." (2001).
4. Deshmukh, Hanumant, and JigneshMalavia. SCWCD exam study kit: Java web component developer certification. Manning Publications Co., 2002.
5. Cay, Horstmann, and Cornell Gary. "Core Java 2, Volume II–Advanced Features." (2005).

REFERENCES:

1. Kito D. Mann, "Java Server Faces in Action",2nd Edition, Dreamtech Press , 4 January 2005
2. Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley, "JDBC™ API Tutorial and Reference" Third Edition, Addison Wesley, 11 June 2009).
3. GiulioZambon , "Beginning JSP, JSF and Tomcat", 2nd Edition , Apress ,29 September 2012.
4. AnghelLeonard , "JSF2.0 CookBook" ,3rd Edition , PACKT publication ,2010.
5. Bryan Basham, Kathy Sierra & Bert Bates, "Head First Servlets and JSP" , 3rd Edition , O'Reilly Media,2012.

LIST OF EXPERIMENTS:

1. How to set up multiple panels, compound borders, combo boxes.
2. Write a Program to implement Event handling.
3. Write a Program to develop Java Servlet and use request and response
4. Write a Program which allows the user to enter data in a jsp form and display in webpage

5. Show basic JDBC operation

6. Create Servlet file which contains following function:

- 1) Connect
- 2) Create Database
- 3) Create table
- 4) Insert records into respective table
- 5) Update records of particular table of database
- 6) Delete records from table
- 7) Delete table and also Database.

7. Write a program to demonstrate Spring.

8. Write a program to demonstrate Spring JDBC operation.

9. Write a program to demonstrate Java Mail functionalities.

10. Write a program to demonstrate JMS queues.

S.6 Mobile App Development Lab (BTIT-306)

UNIT-I

Introduction to mobile Devices and Administrative,Mobile Devices vs. Desktop devices - ARM and Intel Architectures - Power Management - Screen Resolution - Touch interfaces - Application development - App Store, Google Play, Windows Store - Development Environments Introduction: XCode , Eclipse , PhoneGAP, etc - Native vs. web applications.

UNIT-II

Mobile OS Architectures:Comparing and Contrasting architectures of all three – Android, iOS and Windows - Underlying OS (Darwin vs. Linux vs. Win 8) - Kernel structure and native level programming - Runtime (Objective-C vs. Dalvik vs. WinRT) - Approaches to Power Management – Security.

UNIT-III

Introduction to Android Development Environment, Android/iOS/Win 8 Survival and basic apps, Mobile frameworks, Tools, Native Level Programming on Android Low-level programming on (jailbroken) iOS or Windows low level APIs. Study Different Open Source Frameworks, Tools And Basic Languages Used For Mobile Development

UNIT-IV

Intents and Service: Android ,Intents and Services , Characteristics of Mobile Applications, Successful Mobile Development, Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Android Storing and Retrieving Data ,Working with a Content Provider, Communications Via Network and the Web, State Machine, Correct Communications Model

UNIT-V

Android Networking and Web , Telephony, Wireless Connectivity and Mobile Apps, Notifications and Alarms, Memory Management, Graphics Performance and Multithreading, Graphics and UI Performance Android Graphics and MultimediaMobile Agents , Location Mobility and Location Based Packaging and DeployingPerformance Best Practices.

TEXT BOOKS:

1. John Horton, “Android Programming for Beginners: Build in-depth, full-featured Android apps starting from zero programming experience” 2 nd Edition, Packt Publishing, October 31, 2018
2. Mike van Drongelen, Aravind Krishnaswamy, “Lean Mobile App Development”, 2nd edition, Packt Publishing, 28 Nov 2017
3. Chris Griffith , “Mobile App Development with Ionic”, Revised Edition, O'Reilly Media, August 2017
4. Rick Boyer , Kyle Mew, “Android Application Development Cookbook” 2 nd Revised Edition, Packt Publishing, March 31, 2016
5. Christian Keur “iOS Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides) ” 6 edition Big Nerd Ranch Guides Publishing 27 Dec. 2016

REFERENCES:

1. <http://www.tutorialspoint.com/android/>
2. <https://www.lynda.com/Mobile-Apps-training-tutorials>
3. https://www.tutorialspoint.com/ios/ios_objective_c.htm
4. <https://developer.android.com/training/basics/>

LIST OF EXPERIMENTS:

1. Study of difference open source mobile development tools.
2. Installation of eclipse and Android Studio.
3. Develop an application that uses GUI components, Font and Colors.
4. Develop an application that uses Layout Managers and event listeners.
5. Develop a native calculator application.
6. Develop an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of database.
8. Develop an application that makes use of RSS Feed.
9. Implement an application that implements Multi threading.
10. Develop a native application that uses GPS location information.
11. Implement an application that writes data to the SD card.
12. Implement an application that creates an alert upon receiving a message.
13. Develop a mobile application that creates alarm clock.

S.7 Unix and Shell Programming Lab (BTIT-406)

UNIT-I Introduction to UNIX –

The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal and External Commands, Command Structure. General purpose utilities: cal, date, echo, printf, bc, script, passwd, path, who, uname, tty, stty, pwd, cd, mkdir, rmdir, od.

UNIT-II Handling Files and C Environment –

The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount, chmod, The vi editor ,security by file Permissions. Networking commands: ping, telnet, ftp, finger, arp, rlogin. The C compiler, vi editor, compiler options, and run the programs.

UNIT-III: Shell Basics –

Types of shells, Shell Functionality, Work Environment, Writing script & executing basic script, Debugging script, Making interactive scripts, Variables (default variables), Mathematical expressions. Conditional statements: If-else-elif, Test command, Logical operators - AND, OR, NOT, Case –esac. Loops: While, For, Until, Break & continue.

UNIT-IV: Command Line Arguments & Regular Expression –

Command line arguments, Positional parameters, Set & shift, IFS. Functions & file manipulations: Processing file line by line, Functions. Regular Expression & Filters: Regular expression, Grep, cut, sort commands, Grep patterns.

UNIT-V: SED and AWK –

SED, Scripts, Operation, Addresses, commands, Applications, grep and sed. AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

Text Books:

1. Stephen Prata “Advanced UNIX: A Programming's Guide”, BPB Publications, 2017.
2. Maurice J. Bach “Design of UNIX O.S. ”, PHI Learning, 2015.
3. Brian W. Kernighan & Robe Pike, “The UNIX Programming Environment”, PHI Learning, 2015.
4. Sumitabha Das: “YOUR UNIX – The Ultimate Guide”, Tata McGraw Hill, 23rdreprint, 2012.
5. Yashavant Kanetkar, “Unix Shell programming”, 1st Edition, BPB Publisher, 2010.

Reference Books:

1. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and Shell Programming”, 1st Edition, Cengage Learning India, 2003.
2. Graham Glass, King Ables, “Unix for programmers and users”, 3rd Edition, Pearson Education, 2009.
3. Sumitabha Das, “Unix Concepts and Applications”, 4th Edition. TMH, 2006.
4. N.B. Venkateswarlu, “Advanced Unix programming”, 2nd Edition, B S Publications, 2010.

List of Practical:

1. Perform installation of UNIX/LINUX operating system.
2. Study of UNIX general purpose utility commands.
3. Execution of various file/directory handling commands.
4. Working with the vi editor: Creating and editing a text file with the vi text editor using the standard vi editor commands.
5. Write a shell script for calculator (to perform basic arithmetic and logical calculations).
6. Write a shell script sum.sh that takes an unspecified number of command line arguments (up to 9) of ints and finds their sum. Modify the code to add a number to the sum only if the number is greater than 10.
7. Write a shell script that will take an input file and remove identical lines (or duplicate lines from the file).
8. Write a shell script takes the name a path (eg: /afs/andrew/course/15/123/handin), and counts all the sub directories (recursively).

9. Shell scripts to explore system variables such as PATH, HOME etc.
10. Write a shell script that takes a name of a folder as a command line argument, and produce a file that contains the names of all sub folders with size 0 (that is empty sub folders)
11. Execution of various system administrative commands.
12. Write awk script that uses all of its features.
13. Write a shell script to display list of users currently logged in.
14. Write a shell script to delete all the temporary files.
15. Write a shell script to search an element from an array using binary searching.
16. Write shell script to perform different string operations of arrays.

- Sem 5

S.1 Software Engineering and Project Management (BTCS-504)

UNIT-I Nature of Software:

Software Engineering, Software Process, A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models- Waterfall Model, Incremental Models, Evolutionary Models, Concurrent Models, Specialized Process Model, Unified Process, Personal and Team process Models, Process technology, Agile development.

UNIT-II Functional and Non-functional Requirements:

Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented Software Development, Use case Modeling, System and Software Requirement Specifications, Requirement Validation, Traceability.

UNIT-III The Software Design Process:

Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, SA/SD Component Based Design, Design Metrics.

UNIT-IV Software Testing Strategies-

Approach: Issues, Validation Testing and Their Criteria, System Testing, Alpha-Beta Testing, Debugging, Testing Conventional Applications, Testing Object Oriented Applications ,Testing Web Applications.

UNIT-V Need and Types of Maintenance:

Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance(SQA). Project Metrics.

Text Books:

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Tata McGraw-Hill, Seventh edition, 2009.
2. Richard Fairley, “Software Engineering Concepts” –, Tata Mcgraw Hill, 2008.
3. Pankaj Jalote ,”An Integrated Approach to Software Engineering”, Narosa Pub, 2005.

4. Richard H.Thayer,"Software Enginerring & Project Managements",Willey India

Reference:

- 1. Bernd Bruegge, Allen H. Dutoit, " Object-Oriented Software Engineering" Using UML, Patterns, and Java, PEARSON Third Edition, 2017.**
- 2. Waman S.Jawadekar,"Software Enginerring", TMH**
- 3. Ian Sommerville, "Software Engineering", Seventh Edition, Pearson Education Asia, 2007.**
- 4. Rajib Mall, "Fundamentals of Software Engineering" Second Edition, PHI Learning.**

List of Practical: Select a topic of the project, and then make the report on following points

- 1. System Analysis**
 - 1.1. Identification of Need**
 - 1.2. Preliminary Investigation**
- 2. Feasibility Study**
 - 2.1. Technical Feasibility**
 - 2.2. Economical Feasibility**
 - 2.3. Operational Feasibility**
- 3. Literature Survey**
 - 3.1. Work done by other**
 - 3.2. Benefits**
 - 3.3. Proposed Solution**
 - 3.4. Technology used**
- 4. Software Engineering Approach**
 - 4.1. Software Engineering paradigm Applied**
 - 4.1.1. Description**
 - 4.1.2. Advantage & Disadvantages**
 - 4.1.3. Reasons for use**
 - 4.2 Requirement Analysis**
 - 4.2.1 Software Requirement Specification**
 - 4.2.1.1 Glossary**
 - 4.2.1.2 Supplementary Specifications**
 - 4.2.1.3 Use Case Model**
 - 4.2.1.4 Comparative analysis documents**
 - 4.2.2 Conceptual Level Activity Diagram**
 - 4.3 Planning Managerial Issues**
 - 4.3.1 Planning Scope**
 - 4.3.2 Project Resources**
 - 4.3.3 Team Organization**
 - 4.3.4 Project Scheduling**
 - 4.3.5 Estimation**
 - 4.3.6 Risk Analysis**
 - 4.3.7 Security Plan**
 - 4.4 Design**
 - 4.4.1. Design Concept**
 - 4.4.2. Design Technique**
 - 4.4.3. Modeling**

4.4.3.1. ER Model

4.4.3.2. DFD Model

4.4.3.2.1. DFD Model Level-0 and 1

4.4.3.2.2. DFD Model Level 2 and 3

4.4.3.3. Data Dictionary

4.4.3.4. Activity Diagram

4.4.3.5. Software Architecture

4.5 Implementation Phase

4.5.1. Language Used Characteristics

4.5.2. Coding

4.6 Testing

4.6.1. Testing Objectives

4.6.2. Testing Methods & Strategies used along with test data and the error listed for each test case for each function provided by the system.

S.2 Artificial Intelligence (BTCS-511)

UNIT-I Introduction:

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT-II Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search. **UNIT-III**

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networksrepresentation, construction and inference, temporal model, hidden Markov model.

UNIT-IV Markov Decision process:

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT-V Reinforcement Learning:

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd Edition, Prentice Hall.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill.
3. Trivedi, M.C., “A Classical Approach to Artifical Intelligence”, Khanna Publishing House, Delhi.
4. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011.
5. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010.

WEBSITES FOR REFERENCE:

1. <https://nptel.ac.in/courses/106105077>

2. <https://nptel.ac.in/courses/106106126>
3. <https://aima.cs.berkeley.edu>
4. https://ai.berkeley.edu/project_overview.html (for Practicals)

LIST OF PRACTICALS:

1. Write a programme to conduct uninformed and informed search.
2. Write a programme to conduct game search.
3. Write a programme to construct a Bayesian network from given data.
4. Write a programme to infer from the Bayesian network.
5. Write a programme to run value and policy iteration in a grid world.
6. Write a programme to do reinforcement learning in a grid world.
7. Mini Project work.

S.3 Network Security And Cryptography (BTICS-501)

UNIT I Introduction to Network Security:

Introduction, Need for Security, Security in Networks : Threats in networks, Network Security Controls – Architecture, Attacks on Computers & Computer Security, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honey pots.

UNIT II Security Mechanism:

Proxy Servers and Anonymizers, Firewall, Types of firewall, Password Cracking Techniques. Cryptography: Concepts & Techniques: Introduction, Plaintext & Cipher text, Creaser Cipher, Substitution Techniques, Substitution Boxes (SBoxes), Permutation Cipher, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography, Key Range & Key Size.

UNIT III Symmetric Key Algorithm:

Introduction of Block Ciphers, Overview of Symmetric Key Cryptography, DES(Data Encryption Standard) algorithm, Double DES Triple DES, AES,IDEA(International Data Encryption Algorithm) algorithm.

UNIT IV Asymmetric Key Algorithm:

Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Diffie-Hellman Key Exchange, Digital Signature, Basic concepts of Message Digest and Hash Function. Man in Middle Attack,DoS and DDoS Attacks.

UNIT V Internet Security Protocols:

User Authentication Basic Concepts, SSL protocol, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Biometric Authentication. Steganography it's importance. Basics of mail security, Pretty Good Privacy, S/MIME.

Text Books:

- 1.“Cryptography and Network Security”, William Stallings, 2nd Edition, Pearson Education Asia
2. “Network Security private communication in a public world”, C. Kaufman, R. Perlman and M. Speciner,Pearson

3. Cryptography & Network Security: Atul Kahate, TMH

References:

- 1.Cryptography And Network Security Principles And Practice Fourth Edition, William Stallings, Pearson Education**
- 2. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall PTR**
- 3. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall**
- 4. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.**
- 5.“Building Internet Firewalls”, Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly.**
- 6.<http://nptel.ac.in/>**

List of Practical:

- 1. Write a Program to implement Ceaser Cipher**
- 2. Write a Program to implement Substitution Cipher with equation $c=3x+12$**
- 3. Write a Program to implement polyalphabetic Cipher**
- 4. Write a Program to implement Rail fence technique**
- 5. Write a Program to implement Simple Columner Transposition technique**
- 6. Write a Program to implement Advanced Columner Transposition technique**
- 7. Write a Program to implement Rotation Cipher**
- 8. Create a Virtual Private Network.**
- 9. Write a Program to implement Simple RSA Algorithm with small numbers.**
- 10. Write a Program to implement Simple Diffie- Hellman Key Exchange Algorithms with small numbers.**

S.4 Computer Graphics and Multimedia (BTCS-503)

UNIT I Introduction to Computer Graphics:-

What is Computer Graphics?, Where Computer Generated pictures are used, Elements of Pictures created in Computer Graphics Graphics display devices,Graphics input primitives and Devices.Introduction to openGL:- Getting started Making pictures, Drawing basic primitivesSimple interaction with mouse and keyboard

UNIT II Points and Lines, AntialiasingLine Drawing Algorithm:-

DDA line drawing algorithm, parallel drawing algorithmBresenham’s drawing algorithm with example. Circle and Ellipse generating algorithms:-Mid-point Circle algorithm with example Mid-point Ellipse algorithmMid-point Ellipse algorithm with example Parametric Cubic Curves:- Bezier curvesB-Spline curves Filled Area Primitives:-Scan line polygon fill algorithm, Pattern fill algorithm Inside-Outside Tests, Boundary fill algorithms, Flood fill algorithms

UNIT III

2D Geometric Transformations -

Basic transformation, Matrix representation and Homogeneous Coordinates Composite transformationOther transformations. Transformation between coordinated systems.Window to Viewport coordinate transformation,

Clipping operations –

Point clipping, Line clipping:-Cohen – Sutherland line clippingLiang – Barsky line clippingMidpoint subdivision

Polygon Clipping-Sutherland –

Hodgeman polygon clippingWeiler – Atherton polygon clipping.3D object representation methods B-REP , sweep representations , CSG

Basic transformations-

Translation,Rotation, Scaling

Other transformations-

Reflection,Rotation about an arbitrary axis Composite transformations Projections – Parallel and Perspective 3D clipping

UNIT IV

3D Geometric Transformations and 3D Viewing Classification of Visible

Surface Detection algorithm:-

Translation,Rotation, Scaling

Other transformations:-

Reflection,Rotation about an arbitrary axis Composite transformations Projections,Back Surface detection method Depth Buffer method Scan line method BSP tree method, Area Subdivision method.

UNIT V Multimedia System:

An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards.i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP,MOV, MPEG , compression standards, compression through spatial and temporal redundancy. Multimedia Authoring .

TEXT BOOKS:

1. Sinha and Udai , "Computer Graphics", Tata McGraw Hill
2. Parekh "Principles of Multimedia" Tata McGraw Hill
3. Prabhat k Andleigh, KiranThakral , "Multimedia System Design " PHI Pub.
4. Donald Hearn and M.P. Becker "Computer Graphics" Pearson Pub.

REFERENCES:

1. Computer Graphics, C Version, 2e Paperback – 2002
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. David F Rogers, "Procedural elements for Computer Graphics", Tata McGraw Hill, Second Edition.
5. Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice in C", Second edition, Pearson Education.
6. David Hillmaa, "Multimedia Technology & Applications, Delmar, 1998.

LIST OF EXPERIMENTS:

1. Implement DDA Line Drawing algorithm

2. Implement Bresenham's line drawing algorithm.
3. Implement Mid-Point circle drawing algorithm.
4. Implement Mid-Point ellipse drawing algorithm.
5. Implement cubic Bezier curve.
6. Implement a menu-driven program for 2D transformations.
7. Implement Line clipping algorithm using Cohen-Sutherland.
8. Implement Polygon Clipping using Sutherland Hodgemam.
9. Implement Scan line fill algorithm.
10. Study of Multimedia and Program for Flash.

S.5 WIRELESS COMMUNICATION NETWORKS (BTIT-511)

UNIT-I Introduction to Wireless Communication System:

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Second generation Cellular Networks, Third Generation (3G) Wireless Networks ,Wireless Local Loop(WLL),Wireless Local Area network(WLAN),

UNIT-II The Cellular Concept- System Design Fundamentals:

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Cochannel and adjacent interference, Hand off Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization, Repeaters, Micro cell zone concept, Channel antenna system design considerations.

UNIT-III Mobile Radio Propagation Model, Small Scale Fading and diversity:

Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering, Link budget design, Max. Distance Coverage formula, Empirical formula for path loss, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread, Feher's delay spread, Types of small scale Fading, Rayleigh and rician distribution.

UNIT-IV Multiple Access Techniques:

Introduction, Comparisons of multiple Access Strategies TDMA, CDMA, FDMA, OFDM, CSMA Protocols. Mobile Network And Transport Layers :Mobile IP , Dynamic Host Configuration Protocol, Mobile Ad Hoc Routing Protocols, Multicast routing, TCP over Wireless Networks , Indirect TCP , Snooping TCP, Mobile TCP .Wireless Systems: GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, CDMA forward channels, CDMA reverse channels, Soft hand off, CDMA features, Power control in CDMA, Performance of CDMA System, GPRS system architecture.

UNIT-V

Introduction to Wi-Fi, WiMAX, Zig-Bee Networks, Software Defined Radio, UWB Radio, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network. Application Layer :WAP Model, Mobile Location based services ,WAP Gateway ,WAP protocols wireless bearers for WAP , WML ,WMLScripts.

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education,
2. William Stallings, "Wireless Communications and Networks", Pearson Education.
3. William D Stanley : Network Analysis with Applications, Pearson Education.
4. Roy Choudhary D: Network and systems, New Age Publication.
5. Wireless Communication, Theodore S. Rappaport, Prentice hall

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", First Edition, Pearson Education, 200UNIT III.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 200UNIT III.
3. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
4. Wireless digital communication, Kamilo Feher, PH.

S.6 MANAGEMENT INFORMATION SYSTEM (BTIT-513)

UNIT-I Organizations and Computing:

Introduction, Modern Organization-IT enabled- NetworkedDispersed- Knowledge Organization, Information Systems in Organizations- what are information systems?, Brief history of computing- ENIAC: Way to commercial computers- Advent of artificial intelligence- advent of personal computing-Free Software Movement- Advent of Internet, The role of internet- Internet and Web: they are different-the internet changes everything

UNIT-II Managing Information Systems in Organizations:

Introduction, Managing in the Internet Era, Managing Information Systems in Organization- the IT interaction model, Challenges for the managerwhat information to build?-how much to spend on information systems?-what level of capabilities should be created with information systems?-how centralized should the services be?-what security levels are required?-what is technology road map for the organization?

UNIT-III Data and Information:

Introduction, data and information- measuring data, information as a resource, information in organizational functions, types of information technology, types of information systemstransaction processing systems-management information system.

UNIT-IV Decision making and communication:

Introduction, Decision making with MIS-Tactical decisionsoperational decisions-strategic decisions, communication in organizations- types of communicationexamples of communications in organizations- decision making with communication technology

UNIT-V Strategy:

Introduction, Information goods-properties-technology lock-in and switching costs-network externalities-positive feedback-tippy markets, information systems and competitive strategy-

value chain, the Role of CIO-information system's plan-vendor coordination-technology updates-return on investment on technology.

TEXT BOOKS:

1. Kenneth C. Laudon& Jane P. Laudon, Essentials of Management Information Systems, Tenth Edition, Pearson Prentice, Hall, 2012
2. Terry Lucey, Management Information Systems, Ninth Edition, 2005, Thompson.

S.7 INFORMATION STORAGE AND MANAGEMENT (BTIT-611)

Unit-I: Introduction:

Digital data and its types, Information storage, Key characteristics of data center, Evolution of computing platforms. Introduction to storage technology: Data Proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

Unit-II: Storage System Architecture:

Intelligent disk subsystems overview, Contrast of integrants modular array, Component Architecture of Intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Unit-III: Introduction to network storage:

JBOD, DAS, NAS, SAN & CAS evolution and comparison, Applications, Elements, Connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN

Unit-IV: Hybrid storage solutions and virtualization:

memory, network, server, storage & appliances. Data centre concepts & requirements, Backup and disaster recovery. Industry Management standards, standard framework applications, Key management metrics.

Unit-V: Information storage on clouds:

concept of cloud, cloud computing, storage on cloud, Cloud benefits, Cloud computing evolution. Application & services on cloud, cloud service providers, cloud deployment models, Essential characteristics of cloud computing.

TEXT BOOK:

4. G.Somasundaram & Alok Shrivastava editors, ISM: Storing, Managing, and Protecting Digital Information; Wiley India

REFERENCES:

1. Saurabh; Cloud Computing : Insight into New era Infrastructure; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained: Basic and application of fiber channels, SAN, NAS, ISESI, INFINIBAND and FCOE, Wiley India.
3. Sosinsky, Cloud Computing Bible, Wiley India.

S.8 ENTERPRISE RESOURCE PLANNING (BTIT-712)

Unit I: Introduction to ERP

- 1. Enterprise Resource Planning –Introduction**
- 2. Need of ERP**
- 3. Advantages of ERP**
- 4. Growth of ERP**

Unit II: ERP and Related Technologies

- 1. Business process Reengineering (BPR)**
- 2. Management Information System (MIS)**
- 3. Decision Support Systems (DSS) Executive Support Systems (ESS)**
- 4. Data Warehousing**
- 5. Data Mining**
- 6. Online Analytical Processing (OLTP)**
- 7. Supply Chain Management (SCM)**
- 8. Customer Relationship Management (CRM)**

Unit III: Modules of ERP

- 1. ERP modules & Vendors** Finance Production planning, control & maintenance Sales & Distribution Human Resource Management (HRM)
- 2. Inventory Control System.**
- 3. Quality Management** ERP Market

Unit IV:

- 1. ERP Implementation**
- 2. ERP Implementation Life Cycles** Evaluation and selection of ERP package
- 3. Project planning Implementation**
- 4. Team training & testing**
- 5. End user training & Going Live**
- 6. Post Evaluation & Maintenance.**

Unit V: Post implementation of ERP

- 4. ERP Case Studies** Post implementation review of ERP Packages in Manufacturing Services

REFERENCES:

- 1. Leon, A. (2008). Enterprise Resource Planning.** New Delhi; Tata McGraw-Hil Education
- 2. Kumar, V., Venkitakrishna, N. K. (1998). ERP - Concepts and Practice.** New Delhi; PHI
- 3. Garg, Venkitakrishnan (2003).ERP Concepts and Planning.** New Delhi; PHI Learning.

S.9 Programming with Python (BTCS-407)

UNIT-I Introduction to Python:

The basic elements of Python, Branching programs, Strings and Input, Iteration. Functions, Scoping and Abstraction: Functions and Scoping, Specifications, Recursion, Global variables, Modules, Files.

UNIT-II Testing and Debugging:

Testing, Debugging. Structured Types, Mutability and Higher order Functions: Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries.

UNIT-III Exceptions and assertions:

Handling exceptions, Exceptions as a control flow mechanism, Assertions. Classes and Object oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and information hiding.

UNIT-IV Some simple Algorithms and Data Structures:

Search Algorithms, Sorting Algorithms, Hashtables. Plotting and more about Classes: Plotting using PyLab, Plotting mortgages and extended examples.

UNIT-V Dynamic Programming:

Fibonacci sequence revisited, Dynamic programming and the 0/1 Knapsack algorithm, Dynamic programming and divide and conquer.

TEXT BOOKS:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.
3. Mark Lutz "Learning Python" O'Reilly Media; 5 edition.
4. David Beazley "Python Cookbook, Third edition" O'Reilly Media

REFERENCES:

1. Python Essential Reference, 4th Edition Addison-Wesley Professional.
2. Mark Lutz "Programming Python: Powerful Object-Oriented Programming" David Beazley "Python Cookbook" Third edition, O'Reilly Media

LIST OF EXPERIMENTS:

1. Write a Python Program to Print Hello world!
2. Write a Program to Add Two Numbers.
3. Write a Program to Find the Square Root.
4. Write a Program to Calculate the Area of a Triangle.
5. Write a Program to Solve Quadratic Equation.
6. Write a Program to Swap Two Variables.
7. Write a Program to Generate a Random Number.
8. Write a Program to Convert Kilometers to Miles.
9. Write a Program to Convert Celsius To Fahrenheit.
10. Write a Program to check if a number is positive, negative or zero.
11. Write a Program to Check if a Number is Odd or Even.
12. Write a Program to Check Leap Year.

- 13. Write a Program to Find the Largest Among Three Numbers.**
- 14. Write a Program to Check Prime Number.**
- 15. Write a Program to Print all Prime Numbers in an Interval.**
- 16. Write a Program to Find the Factorial of a Number.**
- 17. Write a Program to Display the multiplication Table.**
- 18. Write a Program to Print the Fibonacci sequence.**
- 19. Write an English sentence with understandable semantics but incorrect syntax. Write another English sentence which has correct syntax but has semantic errors.**
- 20. Create a program that prompts the user for a number of gallons of gasoline. Reprint that value along with its conversion equivalent number of liters.**
- 21. Write a program that allows a user to enter his or her two favorite foods. The program should then print out the name of a new food by joining the original food names together.**
- 22. Write a Tipper program where the user enters a restaurant bill total. The program should then display two amounts: a 15 percent tip and a 20 percent tip.**
- 23. Write a Car Salesman program where the user enters the base price of a car. The program should add on a bunch of extra fees such as tax, license, dealer prep, and destination charge. Make tax and license a percent of the base price. The other fees should be set values. Display the actual price of the car once all the extras are applied.**
- 24. Create a program with a function that calculates the area of a circle by taking a radius from the user.**
- 25. Write your own sum function called mySum that takes a list as a parameter and returns the accumulated sum.**

S.10 Ethical Hacking Lab-1 (BTICS-502)

UNIT I Security Architecture:

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security mechanism, Fundamental Security Design Principles, Attack Surface and Attack trees, A Model for Network Security. Introduction to Cybercrime, Cybercrime and Information Security, Classification of Cybercrimes

UNIT II Vulnerability Assessment:

Casing the Establishment: What is foot printing, Internet Foot printing, Scanning, Enumeration, basic banner grabbing, Enumerating Common Network services .Use of NMAP Tool. Case study: Network Security Monitoring. Securing permission: Securing file and folder permission, Using the encrypting file system, Securing registry permissions. Securing service: Managing service permission, Default services in windows 2000 and windows XP. UNIX: The Quest for Root, Remote Access vs Local access, Remote access, Local access, after hacking root.

UNIT III Attack Plan:

Introduction to Cyber offence, How Criminal plan the attack, Social Engineering, Cyber stalking, Cybercafé and cybercrime, Botnets: The fuel of cybercrime, Attack vector, cloud computing. Cybercrime: Mobile and Wireless devices, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Security Challenges Posed by Mobile Devices, Registry Setting for Mobile Devices, Authentication Service Security, Attack on Mobile Phones..

UNIT IV Penetration Testing:

Malware threats, penetration testing by creating backdoors Tools and Methods Used in Cybercrime, Proxy Server and Anonymizers, Phishing and Identity Theft, Password Cracking,

Keylogger and Spyware, Virus and Worms, Trojan Horse and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attack on Wireless Networks. Use of Tool Nessus .

UNIT V Hacking Techniques:

Dial-up, PBX, Voicemail and VPN hacking, Preparing to dial up, War-Dialing, Brute-Force Scripting PBX hacking, Voice mail hacking, VPN hacking, Network Devices: Discovery Autonomous System Lookup, Public Newsgroups, Service Detection, Network Vulnerability, Detecting Layer 2 Media.

Text Books:

- 1.“Cryptography and Network Security”, William Stallings, 2nd Edition, Pearson Education Asia
- 2.Stuart McClure, Joel Scambray and Goerge Kurtz, Hacking Exposed 7: Network Security Secrets & Solutions, Tata McGraw Hill Publishers, 2010.
3. Bensmith, and Brian Komar, Microsoft Windows Security Resource Kit, Prentice Hall of India, 2010.

References:

- 1.Cryptography And Network Security Principles And Practice Fourth Edition, William Stallings, Pearson Education
2. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall PTR
3. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
4. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.
- 5.“Building Internet Firewalls”, Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, 2nd Edition, Oreilly.
- 6.<http://nptel.ac.in/>
- 7.Stuart McClure, Joel Scambray and Goerge Kurtz, —Hacking Exposed Network Security Secrets & Solutions, 5th Edition, Tata McGraw Hill Publishers, 2010.
8. RafayBaloch, —A Beginners Guide to Ethical Hacking..
9. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, —Gray Hat Hacking The Ethical Hackers Handbook, 3rd Edition, McGraw-Hill Osborne Media paperback(January 27, 2011)

List of Practical:

1. Installation of Kali Linux.
2. Introduction to NMAP Tool.
3. Basic NMAP Feature.
4. Host discovery using NMAP
5. Vulnerability assessment: Using Nessus.
6. Malware threats, penetration testing by creating backdoors.
7. Study of tools for Packet sniffing.
8. Creating Virus for different systems.
9. Study of Password cracking tools.
10. Basic Future of Nessus.
11. Hacking wireless networks
12. Hacking into System through Vulnerability.

- Sem 6

S.1 Ethical Hacking Lab-II (BTICS-602)

UNIT-I Introduction to Wire shark:

Introduction, Functionalities, Uses, features of Wire shark, color coding in wire shark, installation. Concepts of network traffic, filters used in wire shark.

UNIT-II System hacking:

System hacking methodology, steganography, steganalysis attacks, and covering tracks. Different types of Trojans, Trojan analysis, and Trojan countermeasures.

UNIT-III Packet Sniffing:

Introduction, types of sniffing, Packet Sniffing tools and techniques and how to defend against Sniffing. Network scanning techniques and scanning countermeasures. UNIT-IV ARP and DNS Poisoning: Introduction, ARP spoofing, Introduction of MITM, defenses against DNS Poisoning.

UNIT-V SQL Injection:

Introduction, working of SQL injection, SQL injection types and attacks, automation tools for SQL injection and Prevention techniques from SQL injection.

TEXT BOOKS:

1. Stuart McClure, Joel Scambray and George Kurtz, **Hacking Exposed 7: Network Security Secrets & Solutions**, Tata McGraw Hill Publishers, 2010.
2. Bensmith, and Brian Komar, **Microsoft Windows Security Resource Kit**, Prentice Hall of India, 2010.

REFERENCES:

1. Stuart McClure, Joel Scambray and George Kurtz, —**Hacking Exposed Network Security Secrets & Solutions**, 5th Edition, Tata McGraw Hill Publishers, 2010.
2. Rafay Baloch, —**A Beginners Guide to Ethical Hacking**.
3. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, —**Gray Hat Hacking The Ethical Hackers Handbook**, 3rd Edition, McGraw-Hill Osborne Media Paperback (January 27, 2011).

LIST OF EXPERIMENTS:

1. Study and Installation of Wireshark.
2. Wireshark: Experiment to monitor live network capturing packets and analyzing over the live network.
3. LOIC: DoS attack using LOIC.
4. FTK: Bit level forensic analysis of evidential image and reporting the same.
5. Darkcomet : Develop a malware using Remote Access Tool Darkcomet to take a remote access over network.
6. HTTrack: Website mirroring using Httrack and hosting on a local network.
7. XSS: Inject a client side script to a web application

8. Emailtrackerpro: Email analysis involving header check, tracing the route. Also perform a check on a spam mail and non-spam mail.
9. Study different ARP and DNS poisoning tools.
10. Study different Packet sniffing tools.

S.2 Block Chain (BTCS-618)

UNIT-I Introduction:

Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain. Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT-II Understanding Block chain with Crypto currency:

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT-III Understanding Block chain for Enterprises:

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT-IV Enterprise application of Block chain:

Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain.

UNIT-V Block chain application development:

Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

TEXT BOOKS:

1. Melanie Swan, —**Block Chain: Blueprint for a New Economy**®, O'Reilly, 2015
2. Josh Thompsons, —**Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming**®.
3. Daniel Drescher, —**Block Chain Basics**®, Apress; 1st edition, 2017.
4. Anshul Kaushik, —**Block Chain and Crypto Currencies**®, Khanna Publishing House, Delhi.

5. Imran Bashir,—Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained, Packt Publishing.
6. Ritesh Modi,—Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain, Packt Publishing.
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O’Dowd, Venkatraman. Ramakrishna,—Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer, Import, 2018

LIST OF PRACTICALS:

4. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on Cloud to run.

<https://github.com/hyperledger/><https://docs.docker.com/getstarted/>https://console.ng.bluemix.net/docs/services/block_chain/index.html

https://console.ng.bluemix.net/docs/containers/container_index.html#container_index

2. Create and deploy a block chain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chaincode, and perform invoke and query on your block chain network <https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-using-fabric-sdkjava/>

3. Interact with a block chain network. Execute transactions and requests against a block chain network by creating an app to test the network and its rules.

<https://developer.ibm.com/patterns/interacting-with-a-block-chain-network/>

4. Deploy an asset-transfer app using block chain. Learn app development within a Hyperledger Fabric network.

<https://developer.ibm.com/patterns/deploy-an-asset-transfer-app-using-block-chain/>

5. Use block chain to track fitness club rewards Build a web app that uses Hyperledger Fabric to track and trace member rewards.

<https://developer.ibm.com/patterns/fitness-club-rewards-points-iot-and-retail-integration/>

6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Block chain Starter Plan. Use Hyperledger Fabric to invoke chaincode while storing results and data in the starter plan.

<https://developer.ibm.com/patterns/car-auction-network-hyperledger-fabric-node-sdk-starterplan/>

7. Develop an IoT asset tracking app using Block chain. Use an IoT asset tracking device to improve a supply chain by using Block chain, IoT devices, and Node-RED.

<https://developer.ibm.com/patterns/develop-an-iot-asset-tracking-app-using-block-chain/>

8. Secure art using block chain digital certificates. Node.js-based auction application can help democratize the art market <https://developer.ibm.com/patterns/securing-art-using-block-chain-digital-certificates/>

9. Mini projects such as :

(i) Block chain for telecom roaming, fraud, and overage management. See how communication service providers use block chain to enhance their value chains.

<https://developer.ibm.com/patterns/blockchain-for-telecom-roaming-fraud-andoveragemanagement/>

(ii) Use IoT dashboards to analyze data sent from a Block chain network. Build an IoT app and IoT dashboards with Watson IoT Platform and Node-RED to analyze IoT data sent from a Block chain network. <https://developer.ibm.com/patterns/iot-dashboards-analyze-data-block-chain-network/>

(iii) Create an Android app with Block chain integration. Build a Block chain enabled health and fitness app with Android and Kubernetes.

<https://developer.ibm.com/patterns/create-an-android-app-with-block-chain-integration/>

(iv) Create a global finance block chain application with IBM Block chain Platform Extension for VS Code. Develop a Node.js smart contract and web app for a Global Finance with block chain use case <https://developer.ibm.com/patterns/global-financing-use-case-for-block-chain/>

(v) Develop a voting application using Hyperledger and Ethereum. Build a decentralized app that combines Ethereum's Web3 and Solidity smart contracts with Hyperledger's hosting Fabric and Chaincode EVM <https://developer.ibm.com/patterns/voting-app-hyperledger-ethereum/>

(vi) Create a block chain app for loyalty points with Hyperledger Fabric Ethereum Virtual Machine. Deploy Fabric locally with EVM and create a proxy for interacting with a smart contract through a Node.js web app <https://developer.ibm.com/patterns/loyalty-points-fabric-evm/>

S.3 Robotics (BTCS-617)

UNIT-I Introduction to Robotics:

Types and components of a robot, Classification of robots, closedloop and open-loop control systems. Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT-II Robot Kinematics and Dynamics:

Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT-III Sensors and Vision System:

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity /Affine/Projective transformations. Vision applications in robotics.

UNIT-IV Robot Control:

Basics of control: Transfer functions, Control laws: P, PD, PID. Non-linear and advanced controls.

UNIT-V Robot Actuation Systems:

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

TEXT BOOKS:

1. Saha, S.K., —Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., —Robotics, Oxford, New Delhi, 2006.
3. Niku Saeed B., —Introduction to Robotics: Analysis, Systems, Applications, PHI, New Delhi.
4. Mittal R.K. and Nagrath I.J., —Robotics and Control, Tata McGraw Hill.
5. Mukherjee S., —Robotics and Automation, Khanna Publishing House, Delhi.
6. Craig, J.J., —Introduction to Robotics: Mechanics and Control, Pearson, New Delhi, 2009
7. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, —Robot Modelling and Control, John Wiley and Sons Inc, 2005
8. Steve Heath, —Embedded System Design, 2nd Edition, Newnes, Burlington, 2003.
9. Merzouki R., Samantaray A.K., Phatak P.M. and Bouamama B. Ould, —Intelligent Mechatronic System: Modeling, Control and Diagnosis, Springer.

LIST OF PRACTICALS:

1. Study components of a real robot and its DH parameters.
2. Forward kinematics and validate using a software (Robo Analyser or any other free software tool).
3. Inverse kinematics of the real robot and validation using any software.
4. Use of open source computer vision programming tool openCV.
5. Image Processing using openCV.
6. Image Processing for color/shape detection.
7. Positioning and orientation of robot arm.
8. Control experiment using available hardware or software.
9. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
10. Project work

S.4 Software Testing and Quality Assurance (BTCS-613)

UNIT-I BASIC CONCEPTS:

Basic Testing Vocabulary, Quality Assurance versus Quality Control, The Cost of Quality, Software Quality Factors, Software Defect, The Multiple Roles of the Software Tester(People Relationships), Scope of Testing, Testing Constraints, Various software development Life cycles (SDLC), Independent Testing, QA Process, Levels of Testing, The —V Concept of Testing.

UNIT-II WHITE BOX TESTING:

White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis.

UNIT-III BLACK BOX TESTING:

Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning -Syntax testing - Finite state testing - Levels of testing – Unit testing- Integration Testing

UNIT-IV SYSTEM TESTING –

Functional testing-non-Functional testing-acceptancetestingperformance testing –Factors and Methodology for Performance testing, Regression testingMethodology for Regression-testing.Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, Quality Characteristics, Software Quality Standard

UNIT-V ADVANCE SOFTWARE TESTING METHOD (OBJECT ORIENTED TESTING):

Syntax testing - Finite State testing - Levels of testing - Unit, Integration and System Testing. Challenges - Differences from testing non-OO Software - Class testing strategies - State-based Testing Software quality Assurance: ISO 9000; CMM and Test Management Issues; Quality Assurance personnel Issues.

TEXT BOOKS:

1. KshirasagarNaik&PriyadarshiTripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,Software Enginerring, TMH
4. Sommerville,Software Enginerring,Pearson Education.
- 5.—IBM CE-Enablement Program- Essentials of Software Engineering (OOAD & SW Lifecycle), IBM Career Education

REFERENCES:

1. KshirasagarNaik&PriyadarshiTripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,Software Enginerring, TMH
4. Sommerville,Software Enginerring,Pearson Education.
5. <http://www.softwaretestinghelp.com/online-software-testing-course-syllabus/>
6. <https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/1217201473127725.pdf>
7. <http://www.tutorialspoint.com/uml/>

LIST OF EXPERIMENTS:

1. Design test cases using Boundary value analysis by taking quadratic equation problem.
2. Design test cases using Equivalence class partitioning taking triangle problem.
3. Design test cases using Decision table taking triangle problem.
4. Design independent paths by calculating cyclometer complexity using date problem.
5. Design independent paths by taking DD path using date problem.
6. Design the test cases for login page of AMIZONE.
7. Manual Testing for PAN card verification.
8. Generate test case for ATM machine.
9. Overview of Testing process using Rational Robot.
10. Write a script to record verification point using Rational Robot (For GUI testing of single click on window OS).
11. Write a script to record verification point for Clip Board and alphanumeric values using Rational Robot.

S.5 Simulation and Modeling (BTCS-612)

UNIT-I INTRODUCTION

Introduction to simulation & modeling, advantages and disadvantages of simulation, application areas in communication, computer and software design, systems and systems environment, components of a system, discrete and continuous systems, model of a system, types of models, discrete-event simulation, steps in a simulation study. Simulation Examples- Simulation of queueing systems, on-demand and inventory systems, simulation for reliability analysis, Introduction to GPSS.

UNIT-II COMPUTER BASED SYSTEM SIMULATION:

Types of System Simulation, Monte Carlo Method, comparison of analytical and Simulation methods, Markov Model, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

UNIT III INTRODUCTION TO QUEUING THEORY

Characteristics of queuing system, Poisson's formula, birth-death system, equilibrium of queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system, FSM, Petri-net Model.

UNIT-IV VERIFICATION AND VALIDATION

Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions , Validating Input & Output Transformations, Design of simulation experiments,

UNIT-V SIMULATION TOOLS Simulation Tools –

Model Input – High level computer system simulation – CPU – Memory, Simulation – Comparison of systems via simulation – Simulation Programming techniques, Development of Simulation models, General Purpose Simulation Package-MATLAB, ARENA, EXTEND, Study of SIMULA, DYNAMO

TEXT BOOKS:

- 1 Gordon G., **System simulation**, PHI Learning
- 2.Singh V.P **System Simulation and Modeling** NEW AGE INTERNATIONAL, PUBLISHERS
- 3.Taha H, **Operations Research**; PHI.
- 4.Payer, T., **Introduction to system simulation**, McGraw Hill.
- 5.Spriet JA; **Computer Aided Modeling and Simulation**, Academic Press INC; USA

REFERENCES:

1. J K Sharma, **Operations Research Theory and Application**, Pearson Education Pvt Ltd, 2 Edition Banks J; **Hand book of Simulation**; John Wiley.
- 2.Law AM and Kelton WD; **Simulation Modeling and Analysis**; TMH

LIST OF EXPERIMENTS:

1. Simulate CPU scheduling algorithm using queueing system.
2. Simulate multiplexer using queueing system.

3. Simulate Network congestion control algorithms using Petri-net Model.
4. Simulate disk scheduling algorithms Petri-net Model.
5. Verification and validation of Petri-net Model.
6. Simulate a Manufacturing shop and write a program in GPSS.
7. Simulate Telephone system model and write a program in SIMSCRIPT.
8. Graphical Simulation and Modeling using MATLAB.
9. Study of SIMULA.
10. Study of DYNAMO.

S.6 Data Science (BTCS-608)

UNIT-I Introduction to Data Science:

Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

UNIT-II Introduction to Programming Tools for Data Science:

Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

UNIT-III Mathematical Foundations:

Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference

UNIT-IV Machine Learning: Overview of Machine learning concepts –

Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time SeriesLinear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning And Generalization, Overview of Deep Learning.

UNIT-V Case Studies of Data Science Application:

Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOKS & REFERENCES:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
5. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
6. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.

7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
<http://www.deeplearningbook.org>
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

LIST OF PRACTICALS:

1. Write a programme in Python to predict the class of the flower based on available attributes.
2. Write a programme in Python to predict if a loan will get approved or not.
3. Write a programme in Python to predict the traffic on a new mode of transport.
4. Write a programme in Python to predict the class of user.
5. Write a programme in Python to indentify the tweets which are hate tweets and which are not.
6. Write a programme in Python to predict the age of the actors.
7. Mini project to predict the time taken to solve a problem given the current status of the user.

S.7 Concepts of System Security (BTICS-601)

UNIT-I Introduction to System Security:

Definition of System Security, Goals, characteristics and importance of system security, principle of easiest penetration, Three pillars of security CIA (Confidentiality, Integrity and Availability), basic introduction of attacks, threat, vulnerability, risk, system policy, security concepts and relationship, system security threats.

UNIT-II Vulnerabilities:

hardware vulnerability, software vulnerability, data vulnerability, Security vulnerability detection tools, and techniques, introduction of primary vulnerabilities in network. Multics: Fundamentals, multics protection system models, multics reference model, multics security, multics vulnerability analysis.

UNIT-III OS Security:

Introduction: Secure OS, Security Goals, Trust Model, Threat Model, Access Control. Fundamentals: Protection system, Lampson's Access Matrix, Mandatory protection system.

UNIT-IV Security in ordinary operating system:

UNIX security, windows security Verifiable security goals: Information flow, information flow secrecy, models, information flow integrity model, the challenges of trusted, process, covert channels

UNIT-V Smartphone Security:

Introduction, importance and characteristics of Smartphone security, Access control in Android operating system, Rooting Android devices, Repackaging attacks, Attacks on apps, Whole-disk encryption.

TEXT BOOKS:

1. Trent Jaeger, Operating system security, Morgan & Claypool Publishers, 2008

2. Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.

REFERENCES:

- 1. Michael Palmer, Guide to Operating system Security Thomson**
- 2. Andrew S Tanenbaum, Modern Operating systems, 3rd Edition**
- 3. Secure Operating Systems. John Mitchell. Multics-Orange Book-Claremont.**
- 4. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.**
- 5. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall, 4th edition, 2010.**
- 6. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press, 2001.**

LIST OF EXPERIMENTS:

- 1. Study of Virus, Malware and Worms.**
- 2. Study of security policies for devices.**
- 3. Study of attack on Smartphone security**
- 4. Study of attacks on android applications.**

- 5. Study of UNIX security architecture.**
- 6. Study of DoS attacks.**
- 7. Study of Physical security challenges.**
- 8. Study of data and hardware vulnerabilities.**
- 9. Study of Trojan Horse and trapdoor.**
- 10. Study of different SQL injection attacks**

S.8 Cloud Computing (BTCS-701)

UNIT-I:

Overview of Cloud Computing Introduction- Evolution, Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment, Advantages, Service & Deployment Models, Infrastructure, and Consumer View, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

UNIT-II :

Cloud Computing Technology Client systems, Networks, server systems and security from services perspectives, security and privacy issues; accessing the cloud with platforms and applications; Cloud storage

UNIT-III:

Working with Cloud Infrastructure as a Service – conceptual model and working, Platform as a Service – conceptual model and functionalities. Software as a Service –conceptual model and working. Trends in Service provisioning with clouds. Working on Microsoft Azure & IBM Smart Cloud.

UNIT-IV:

Using Cloud ServicesCloud collaborative applications and services – case studies with calendars, schedulers and event management; cloud applications in project management. Amazon Web Services & applications, AWS EC2, S3, Cloud Analytics, Cloud Open Stack

UNIT-V:

Case studies- Microsoft Azure, Google App Engine, IBM Smart Cloud and Open source clouds,- Open-Nebula, Sales force and Eucalyptus, Cloud Simulation

TEXT BOOKS:

1. **Cloud Computing: A Practical Approach** by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 2010 by The McGraw-Hill.
2. **Buyya, Selvi ,| Mastering Cloud Computing —,TMH Pub.**
3. **Michael Miller, Cloud computing – Web based Applications, Pearson Publishing, 2011**

REFERENCES:

1. **Kumar Saurabh, —Cloud Computing|, Wiley Pub,2012.**
2. **Krutz , Vines, —Cloud Security , Wiley Pub,2013.**
3. **Sosinsky, — Cloud Computing|, Wiley Pub,2012.**
4. **Murray Woodside; John Chinneck ; Marin Litiou on —Adaptive Cloud Deployment Using Persistence Strategies and Application Awareness|IEEEExplore, Year: 2017, Page(s):277 – 290.**

LIST OF EXPERIMENTS:

1. Service deployment & Usage over cloud using Virtual Box.
2. Performance evaluation of services over cloud using VMware tool.
3. Working of Goggle Drive to make spreadsheet.
4. Working on Heroku for Cloud application deployment.
5. Working on Aneka sevices for Cloud application.
6. Working on services of Google App Engine.
7. Working on Application deployment & services of Microsoft Azure.
8. Working on Application deployment & services of IBM Smart Cloud.
9. Working and configuration of Eucliptus.
10. Deployment & Services of Amazon Web Services.

S.9 Theory of Computation (BTCS-501)

UNIT-I Introduction:

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

UNIT-II Regular Expression (RE):

Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of

Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT-III Context Free Grammar (CFG) and Context Free Languages (CFL):

Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT-IV Push Down Automata (PDA):

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT-V Turing machines (TM):

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to undecidability, undecidable problems about TM, NP hard and NP complete problem, Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

TEXT BOOKS:

1. Hopcroft and Ullman, —Introduction to Automata Theory, Languages and Computation, Pearson Education, 3rd edition, 2014
2. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Pub.House, 2011.
3. K.L.P Mishra & N.Chandrasekaran,—Theory of Computer Science, PHI Learning, 3rd edition, 2006

REFERENCES:

1. Martin J. C., —Introduction to Languages and Theory of Computations, TMH, 4th edition, 2010.
2. Papadimitriou, C. and Lewis, C. L., —Elements of the Theory of Computation, PHI, 1997.
3. Michael Sipser,—Introduction to Theory of Computation, Cengage Learning, 3rd edition, 2013.

- Sem 7

S.1 Human Values and Professional Ethics (BBAI-501)

Unit I: Human Value

1. Definition, Essence, Features and Sources
2. Sources and Classification
3. Hierarchy of Values

4. Values Across Culture

Unit II: Morality

- 1. Definition, Moral Behaviour and Systems**
- 2. Characteristics of Moral Standards**
- 3. Values Vs Ethics Vs Morality**
- 4. Impression Formation and Management**

Unit III: Leadership in Indian Ethical Perspective.

- 1. Leadership, Characteristics**
- 2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)**
- 3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).**

Unit IV: Human Behavior – Indian Thoughts

- 1. Business Ethics its meaning and definition**
- 2. Types, Objectives, Sources, Relevance in Business organisations.**
- 3. Theories of Ethics, Codes of Ethics**

Unit V: Globalization and Ethics

- 4. Sources of Indian Ethos & its impact on human behavior**
- 2. Corporate Citizenship and Social Responsibility – Concept (in Business),**
- 3. Work Ethics and factors affecting work Ethics.**

Suggested Readings

- 1. Beteille, Andre (1991). Society and Politics in India. AthlonePress:New Jersey.**
 - 2. Chakraborty, S. K. (1999). Values and Ethics for Organizations. oxford university press**
 - 3. Fernando, A.C. (2009). Business Ethics - An Indian Perspective .India: Pearson Education: India**
 - 4. Fleddermann, Charles D. (2012). Engineering Ethics. New Jersey: Pearson Education / Prentice Hall.**
 - 5. Boatright, John R (2012). Ethics and the Conduct of Business.Pearson. Education: New Delhi.**
 - 6. Crane, Andrew and Matten, Dirk (2015). Business Ethics. Oxford University Press Inc:New York.**
 - 7. Murthy, C.S.V. (2016). Business Ethics – Text and Cases. Himalaya Publishing House Pvt. Ltd:Mumbai**
 - 8. Naag Rajan, R.R (2016). Professional Ethics and Human Values. New Age International Publications:New Delhi.**
- S.2 Compiler Design (BTCS-601)**

Unit – I: Introduction:

Compiler, Compilers analysis of the source program, Phases of a compiler, Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens. Unit – II: Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

Unit – III: Intermediate Code Generation:

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

Unit – IV: Code Optimization and Run Time Environments:

Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

Unit – V: Code Generation:

Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

Text Books:

1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

References:

1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

List of Experiments:

1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.

7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.

S.3 BIG DATA AND HADOOP (BTCS-702)

UNIT I

Introduction about big data ,Describe details Big data: definition and taxonomy , explain Big data value for the enterprise , Setting up the demo environment ,Describe Hadoop Architecture , Hadoop Distributed File System, MapReduce& HDFS , First steps with the Hadoop , Deep to understand the fundamental of MapReduce

UNIT II –

Hadoop ecosystem, Installing Hadoop Eco System and Integrate With Hive Installation, PigInstallation, Hadoop , Zookeeper Installation , Hbase Installation , Sqoop Installation, Installing Mahout Introduction to Hadoop , Hadoop components: MapReduce/Pig/Hive/HBase, Loading data into Hadoop, Getting data from Hadoop.

UNIT III

Using Hadoop to store data, Learn NoSQL Data Management, Querying big data with Hive, Introduction to the SQL Language , From SQL to HiveQL , Querying big data with Hive, Introduction to HIVE e HIVEQL, Using Hive to query Hadoop files. Moving the Data from RDBMS to Hadoop, Moving the Data from RDBMS to Hbase , Moving the Data from RDBMS to Hive UNIT IV Machine Learning Libraries for big data analysis, Machine Learning Model Deployment, Machine learning tools , Spark & SparkML , H2O , Azure ML.

UNIT V

Monitoring The HadoopCluster , Monitoring Hadoop Cluster, Monitoring Hadoop Cluster with Nagios, Monitoring Hadoop Cluster, Real Time Example in Hadoop , Apache Log viewer Analysis , Market Basket AlgorithmsBig Data Analysis in Practice , Case Study , Preparation of Case Study Report and Presentation , Case Study Presentation

Text Books:

1. Tom White," Hadoop: The Definitive Guide Paperback – 2015" Shroff Publishers & Distributors Private Limited - Mumbai; Fourth edition (2015).
2. V. K. Jain (Author)," Big Data and Hadoop" Khanna Publishers; 1 edition (1 June 2015)
3. Jason Bell (Author) "Machine Learning for Big Data: Hands-On for Developers and Technical Professionals" Wiley (2014)
4. Big Data Analytics &Hadoop by IBM ICE Publications

References:

1. Big data. Architettura, tecnologie e metodi per l'utilizzo di grandi basi di dati, A. Rezzani, Apogeo Education, 2013
2. Hadoop For Dummies, Dirk deRoos, For Dummies, 2014
3. Cohen et al."MAD Skills: New Analysis Practices for Big Data", 2009

4. Ullman, Rajaraman, **Mining of Massive Datasets**, Chapter 2
5. Stonebraker et al., "MapReduce and Parallel DBMS's: Friends or Foes?", Communications of the ACM, January 2010.
6. Dean and Ghemawat, "MapReduce: A Flexible Data Processing Tool", Communications of the ACM, January 2010.

List of Practical's:

1. Installing Hadoop, configure HDFS, Install Zookeeper , Pig Installation, Sqoop Installation, Hbase Installation
2. Configuring Hadoop
3. Running jobs on Hadoop
4. Working on HDFS 5. Hadoop streaming

S.4 Mobile and Cloud Security (BTICS-701)

UNIT I - Cloud Computing Security Architectural Framework:

Cloud Benefits, Business scenarios, Cloud Computing Evolution, cloud vocabulary, Essential Characteristics of Cloud Computing, Cloud deployment models, Cloud Service Models, Multi-Tenancy, Approaches to create a barrier between the Tenants, cloud computing vendors, Cloud Computing threats, Cloud Reference Model, The Cloud Cube Model, Security for Cloud Computing, How Security Gets Integrated.

UNIT II - Mobile Security Framework:

Mobile system architectures, Overview of mobile cellular systems, GSM and UMTS Security architecture & Attacks, Vulnerabilities in Cellular Services, Cellular Jamming, Attacks & Mitigation, Security in Cellular VoIP Services, Mobile application security.

UNIT III - Mobile platform security models and Mobile Commerce Security:

Android, iOS Mobile platform security models, Detecting Android malware in Android markets, Reputation and Trust, Intrusion Detection, Vulnerabilities, Analysis of Mobile commerce platform, secure authentication for mobile users, Mobile commerce security, payment methods, Mobile Coalition key evolving Digital Signature scheme for wireless mobile Networks.

UNIT IV -Data Center Operations and security challenges:

Data Center Operations, Security challenge, Implement Five Principal Characteristics of Cloud Computing, Data center Security Recommendations. Encryption and Key Management: Encryption for Confidentiality and Integrity, Encrypting data at rest, Key Management Lifecycle, Cloud Encryption Standards, Recommendations.

UNIT V - Computing Paradigms:

Virtualization Vulnerabilities, Hypervisor Security-Related Issues, Side Channel Attacks, Data Segregation, ubiquitous, grid, cloud, pervasive, green, ad hoc (mobile, vehicular, flying) networks.

TEXT BOOKS:

- 1.Tim Mather, Subra Kumaraswamy, Shahed Latif, —Cloud Security and Privacy, An Enterprise Perspective on Risks and Compliance, O'reilly Media 2009.

2. S. Kami Makki, Peter Reiher, Kia Makki, Niki Pissinou, Shamila Makki, "Mobile and Wireless Network Security and Privacy", Springer, ISBN 978-0-387-71057-0, 09-Aug2007.
3. Anurag Kumar, D. Manjunath, Joy Kuri "Wireless Networking" Morgan Kaufmann Publishers, First edition, 2009.

REFERENCE BOOKS:

1. Vic (J.R.) Winkler, —Securing the Cloud, Cloud Computer Security Techniques and Tactics, Syngress, April 2011.
2. C. Siva Ram Murthy, B.S. Manoj, "Adhoc Wireless Networks Architectures and Protocols", Prentice Hall, ISBN 9788131706885, 2007
3. Noureddine Boudriga, "Security of Mobile Communications", ISBN 9780849379413,2010.
4. Kitsos, Paris; Zhang, Yan, "RFID Security Techniques, Protocols and System-On-Chip Design ", ISBN 978-0- 387-76481-8, 2008.
5. Johny Cache, Joshua Wright and Vincent Liu," Hacking Wireless Exposed:Wireless Security Secrets & Solutions ", second edition, McGraw Hill, ISBN: 978-0-07-166662-6,2010.

S.5 Cyber Investigation and Digital Forensic (BTICS-702)

UNIT I - Forensics Overview:

Computer Forensics Fundamentals, Benefits of Computer Forensics, Computer Crimes, Computer Forensics Evidence and the Courts, Legal Concerns and Privacy Issues

UNIT II - Introduction to Digital Forensics:

Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics,Biometric Security.

UNIT III - Forensics Process:

Forensics Investigation Process, Securing the Evidence and Crime Scene, Chain of Custody, Law Enforcement Methodologies, Forensics Evidence, Evidence Sources. Evidence Duplication, Preservation, Handling, and Security, Forensics Soundness, Order of Volatility of Evidence, Collection of Evidence on a Live System, Court Admissibility of Volatile Evidence

UNIT IV - Acquisition and Duplication:

Sterilizing Evidence Media, Acquiring Forensics Images, Acquiring Live Volatile Data, Data Analysis, Metadata Extraction, File System Analysis, Performing Searches, Recovering Deleted, Encrypted, and Hidden files, Internet Forensics, Reconstructing Past Internet Activities and Events, E-mail Analysis, Messenger Analysis: Yahoo, MSN, Gmail Chats.

UNIT V - Mobile Device Forensics:

Evidence in Cell Phone, PDA, Blackberry, iPhone, iPod, and MP3. Evidence in CD, DVD, Tape Drive, USB, Flash Memory, Digital Camera, Court Testimony, Testifying in Court, Expert Witness Testimony, Evidence Admissibility

Text Books:

1. Jason Lutgens, Matthew Pepe, Kevin Mandia, **Incident Response & Computer Forensics**, McGraw-Hill Osborne Media, 3rd edition , 2014.
2. Keith J. Jones, Richard Bejtlich, Curtis W. Rose, **Real Digital Forensics: Computer Security and Incident Response**, Paperback – Import, 2005.

References:

1. John Sammons, **The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics** Paperback, February 24, 2012.
2. **Hacking Exposed: Network Security Secrets & Solutions**, Stuart McClure, Joel Scambray and George Kurtz, McGraw-Hill, 2005.

S.6 Virtual Reality (BTCS-716)

UNIT-I Introduction to Virtual Reality:

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark. **3D Computer Graphics:** Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, RealismStereographic image.

UNIT-II Geometric Modeling:

Geometric Modeling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation. **Geometrical Transformations:** Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection. **Generic VR system:** Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

UNIT-III Virtual Environment: Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system. **Physical Simulation:** Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT-IV VR Hardware and Software:

Human factors: Introduction, the eye, the ear, the somatic senses. **VR Hardware:** Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. **VR Software:** Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

UNIT-V VR Applications:

Introduction, Engineering, Entertainment, Science, Training. **The Future:** Virtual environment, modes of interaction

TEXT BOOKS & REFERENCES:

1. John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.

2. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
3. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006.
5. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application and Design", Morgan Kaufmann, 2008.
6. www.vresources.org
7. www.vrac.iastate.edu
8. www.w3.org/MarkUp/VRM

S.7 Soft computing (BTCS-711)

UNIT-I

Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems, Soft Computing and its Techniques, Soft Computing verses Hard Computing. Applications of Soft Computing in the Current industry.

UNIT-II

Introduction to Fuzzy Logic, Crisp Sets, Fuzzy Sets, Fuzzy Relations, Membership Functions and features, Fuzzification, Methods of Membership Value Assignments, Defuzzification and methods, Lambda cuts. Fuzzy Measure, Fuzzy Reasoning, Fuzzy Inference System.

UNIT-III

Neural Network (NN), Biological foundation of Neural Network, Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network

UNIT-IV

Genetic Algorithm, Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

UNIT-V

Neuro-Fuzzy and Soft Computing, Adaptive Neuro-Fuzzy Inference System Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN. Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. Hybridization of other techniques .

TEXT BOOKS

1. S.N. Deepa and S.N. Sivanandam, Principles of Soft Computing, 2ed., Wiley, 2011
2. Vojislav Kecman, Learning and Soft Computing - Support Vector Machines, Neural Networks, and Fuzzy Logic Models, 1ed., The MIT Press, 2001.
3. D. K. Pratihar, Soft Computing, 1ed., Alpha Science, 2007.
4. Timothy J. Ross, Fuzzy logic with Engineering Applications, 3ed., John Wiley and Sons, 2010.
5. S. Rajasekaran and G.A.V. Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, 2ed. PHI

6. David E. Goldberg, Genetic Algorithms in search, Optimization & Machine Learning, 1ed., Addison-Wesley Publishing Company, 1989

REFERENCES

- 1. Jang, Sun and Mizutani, Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, 1ed., Pearson, 1997.**
- 2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, 1ed., Prentice Hall, 1995**
- 3. Simon Haykin, Neural Networks: A Comprehensive Foundation, 2ed. Prentice Hall, 1998**
- 4. Samir Roy and Udit Chakraborty, A Beginner's Approach to Soft Computing, 1ed., Pearson, 2013**

LIST OF EXPERIMENTS

- 1. Fuzzy Membership Functions.**
- 2. Fuzzy set operations and its properties.**
- 3. Fuzzy and Crisp Relations.**
- 4. Fuzzy Inference System**
- 5. McCulloh-Pitts neural network for generate AND, OR functions.**
- 6. Perceptron learning for particular set of problem.**
- 7. OR function with bipolar inputs and targets using Adaline network.**
- 8. XOR function with bipolar inputs and targets using Madaline network.**
- 9. Use of Genetic Algorithm for optimization problem solving.**
- 10. Radial Basis Function and Application**
- 11. Binary and Real Coded genetic Algorithms and Application**
- 12. Introduction to Evolutionary Algorithms and Fundamentals**
- 13. Genetic Expression Programming and Application**
- 14. Introduction to Probabilistic Reasoning and Bayesian Networks Application**

S.8 Quantum Computing (BTCS-715)

UNIT-I Introduction to Quantum Computing:

Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing, Overview of major concepts in Quantum Computing: Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement.

UNIT-II Math Foundation for Quantum Computing:

Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT-III Building Blocks for Quantum Program:

Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc, Programming model for a Quantum Computing Program: Steps performed

on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

UNIT-IV Quantum Algorithms:

Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks, Major Algorithms: Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch -Jozsa Algorithm,

UNIT-V OSS Toolkits for implementing Quantum program:

IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)

TEXT BOOKS & REFERENCES:

1. Michael A. Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quantum Computing Explained", Wiley.
3. IBM Experience: <https://quantumexperience.ng.bluemix.net>
4. Microsoft Quantum Development Kit <https://www.microsoft.com/en-us/quantum/development-kit>
5. Forest SDK PyQuil: <https://pyquil.readthedocs.io/en/stable/>

5) B.tech (CSE_MA)

- Sem 1

S.1 Mobile Application Development-I (BTCSMOB-101)

Unit -I Installation of Swift:

Installation of Swift on macOS and Linux ,REPL, Package manager , creating a package, Building an Executable, Working with multiple Source File.

Unit -II Introduction to Xcode and Swift Playgrounds:

Installation of Xcode ,Working with Xcode, create a simple program and execute it using Xcode , Working with swift playgrounds , create a simple program and execute it using swift playgrounds.

Unit -III Introduction to Swift:

Introduction of Swift, features of Swift ,Data types,constant and variables,operators ,Type Annotations, Naming Constants and Variables, Printing Constants and Variables, Semicolons, Integers: Integer Bounds ,Int, UInt. Floating-Point Numbers: Double ,Float. Type Safety and Type Inference. Numeric Literals, Numeric Type Conversion, Integer Conversion, Integer and Floating-Point Conversion, Boolean.

Unit -IV Strings and Characters:

String Literals, Multiline String Literals, Special Characters in String Literals, Initializing an Empty String, String Mutability, Working with Characters, Concatenating Strings and

Characters, String Interpolation, Counting Characters, Substrings, Comparing Strings, Prefix and Suffix Equality

Unit -V Control Flow: For-In Loops, While Loops: While, Repeat-While. Conditional Statements: If-else, Switch, Control Transfer Statements: continue , break , fallthrough , return , throw.

Text Books:

1. Swift Matthew Mathias, John Gallagher, **Swift Programming: The Big Nerd Ranch Guide** 2nd edition, 2015.
2. Matt Neuberg, **iOS 12 Programming Fundamentals with Swift**, O'Reilly; 5th edition.
3. IBook Apple ,**Introduction to Swift**.

Reference Books:

1. Paris Buttfield-Addison, Jonathon Manning , Tim Nugent **Learning Swift: Building Apps for macOS, iOS, and Beyond**, O'Reilly Media, Inc., 3rd ed, 2018.
2. Jon Hoffman, **Mastering Swift 4**, Packt Publishing Limited ,4th edition,2017.

List of Practical

1. Installation of Swift , Xcode and Playground.
2. Program to print Hello world (Using terminal and Xcode)
3. Program to demonstrate variable and constant declaration in Swift.
4. Program to demonstrate different arithmetic operators in Swift.
5. Program to demonstrate type Annotations and type Inference in Swift.
6. Program to demonstrate numeric type and other conversions in Swift.
7. Program to demonstrate String Literals, Multiline string and special characters.
8. Program to demonstrate String mutability , Empty String and String Interpolation.
9. Program to demonstrate Characters in Swift.
10. Program to demonstrate various String comparisons in Swift.
11. Program to demonstrate For-In loop in Swift.
12. Program to demonstrate While loop in Swift.
13. Program to demonstrate Repeat-While in Swift.
14. Programs to demonstrate various control statements in Swift.

S.2 Programming Skills with 'C' (BTCS-108)

Unit - 1 Introduction to Programming:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals of Algorithms, Flow Charts.

UNIT II Programming using C:

C data types, int, char, float etc, C Expressions, Arithmetic Operation, Relational and Logic Operations, C Assignment Statements, Extension of Assignment of The Operations, C Primitive Input Output Using getchar and putchar, Exposure to the scanf and printf functions, C Statements, conditional executing using if, else, Optionally Switch and Break Statements may be mentioned.

UNIT III Iterations and Subprograms:

Concept of loops, Example of Loops in C Using for, while and do-while, Optionally continue may be mentioned, One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations, Concept of Sub-programming, functions Example of functions, Argument passing mainly for the simple variables.

UNIT IV Pointers and Strings:

Pointers, Relationship Between Arrays and Pointers Argument passing using Pointers Array of Pointers, Passing arrays as Arguments, Strings and C String Library.Structure and Unions, Defining C structures, Passing Strings as Arguments Programming Examples.

Unit –V File handling:

Console Input Output Functions, Disk Input Output Functions, Data files, Command Line Arguments, Bitwise Operators, Enumerated Data Types, Type Casting, macros, The C Preprocessor, More About library Functions.

Reference Books:

1. E Balaguruswamy , Object Oriented Programming With C++ , 4th Edition , TMH, 2008
2. Brian W. Kernighan and Dennis M. Ritchie ,“The C Programming Language”, 2nd Edition, Prentice-Hall India, New Delhi, 2002
3. Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2000
4. H. Cooper and H. Mullish, Jaico Publishing House. “Spirit of C”, 4th Edition, Jaico Publishing House, 2006

List of Practical:

1. Write a program to produce ASCII equivalent of given number.
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user
 - I $(ax+b)/(ax-b)$
 - II $(x^5+10x^4+8x^3+4x+2)$
4. Write a program to find sum of a geometric series.
5. Write a program to cipher a string.
6. Write a program to check whether a given string follows English capitalization rules.
7. Write a program to find sum of the numerical series.
8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.
9. Write a recursive program for tower of Hanoi problem
10. The fibonacci sequence of numbers is 1,1,2,3,5,8..... Based on the recurrence relation
 - a. $F(n)=F(n-1)+F(n-2)$ for $n>2$
 - b. Write a recursive program to print the first m Fibonacci number
11. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
 - a) Addition of two matrices
 - b) Subtraction of two matrices

- c) Finding upper and lower triangular matrices
 - d) Trace of a matrix
 - e) Transpose of a matrix
 - f) Check of matrix symmetry
 - g) Product of two matrices.
12. Write a program that takes two operands and one operator from the user perform the operation and then print the answer.
13. Write a program to print pyramid.
14. Write functions to add, subtract, multiply and divide two complex numbers ($x+iy$) and ($a+ib$) Also write the main program.
15. Write a program to copy one file to other, use command line arguments.
16. Write a program to mask some bit of a number (using bit operations).
17. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

S.3 Mathematics – (BTMACS-101)

UNIT I Differential Calculus:

Limits of functions, continuous functions, uniform continuity, monotone and inverse functions. Differentiable functions, Rolle's theorem, mean value theorems and Taylor's theorem, power series. Functions of several variables, partial derivatives, chain rule, Tangent planes and normals. Maxima, minima, saddle points, Lagrange multipliers, exact differentials

UNIT II Integral Calculus:

Riemann integration, fundamental theorem of integral calculus, improper integrals. Application to length, area, volume, surface area of revolution. Multiple integrals with application to volume, surface area, Change of variables.

UNIT III Numerical Analysis:

Number Representation and Errors: Numerical Errors; Floating Point Representation; Finite Single and Double Precision Differences; Machine Epsilon; Significant Digits. **Numerical Methods for Solving Nonlinear Equations:** Method of Bisection, Secant Method, False Position, Newton-Raphson's Method, Multidimensional Newton's Method, Fixed Point Method and their convergence.

UNIT IV Numerical Methods for Solving System of Linear Equations:

Norms; Condition Numbers, Forward Gaussian Elimination and Backward Substitution; Gauss-Jordan Elimination; FGE with Partial Pivoting and Row Scaling; LU Decomposition; Iterative Methods: Jacobi, Gauss Siedal; Power method and QR method for Eigen Value and Eigenvector.

UNIT V Vector Calculus:

Gradient and directional derivative. Divergence and Curl of Vector point function, line and surface integrals. Green's, Gauss' and Stokes' theorems and their applications.

Text Books:

21. T. M. Apostol, Calculus, Volume I, 2nd Ed, Wiley, 1967.
22. T. M. Apostol, Calculus, Volume II, 2nd Ed, Wiley, 1969.
23. K. E. Atkinson, Numerical Analysis, John Wiley, Low Price Edition(2004).
24. S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 2005.
25. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

Reference Books:

25. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.
26. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
27. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
28. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, 2001.
29. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
30. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill, 2008.

S.4 APPLIED PHYSICS(BTPH-101)

UNIT I Quantum Physics:

Introduction to Quantum hypothesis, Matter wave concept, Wave Group and Particle velocity and their relations, Uncertainty principle with elementary proof and applications to microscope and single slit, Compton Effect, Wave function and its physical significance. Development of time dependent and time independent Schrodinger wave equation, Applications of time independent Schrodinger wave equation.

UNIT II Solid State Physics:

Free electron model, Qualitative Analysis of Kronig Penney Model, effective mass, Fermi level for Intrinsic and Extrinsic semiconductors, P-N junction diode, Zener diode, Tunnel diode, Photodiode, Solar- cells, Hall Effect, Introduction to Superconductivity, Meissner effect, Type I & II Superconductors.

UNIT III Nuclear Physics:

Nuclear Structure & Properties Nuclear models: Liquid drop with semiempirical mass formula & shell model. Particle accelerators: Cyclotron, Synchrotron, Betatron. Counters and Detectors: Giger-Muller counters, Bainbridge Mass Spectrograph and Aston Mass Spectrograph.

UNIT IV Laser & Fiber Optics:

Stimulated and Spontaneous Emission, Einstein's A&B Coefficients, Population Inversion, Pumping, Techniques of Pumping, Optical Resonator, Properties and Applications of Laser, Ruby, Nd:YAG, He-Ne lasers. Introduction to Optical fibre, Acceptance angle and cone,

Numerical Aperture, V- Number, Ray theory of propagation through optical fibre, Pulse dispersion , applications of optical fibre.

UNIT V Wave Optics:

Introduction to Interference, Fresnel's Bi-prism, Interference in Thin films, Newton's rings experiment, Michelson 's interferometer and its application, Introduction to Diffraction and its Types, Diffraction at single slit, double slit, resolving power, Rayleigh criterion, Resolving power of grating, Concept of polarized light, Double refraction, quarter and half wave plate, circularly & elliptically polarized light.

Text Books:

1. Engineering Physics by Dr. S. L. Gupta and Sanjeev Gupta, Dhanpat Rai Publication, New Delhi.
2. Engineering Physics by Navneet Gupta, DhanpatRai Publication, New Delhi.
3. Engineering Physics by H. J. Sawant, Technical Publications, Pune, Maharastra.
4. Engg Physics by M.N. Avdhanulu& P.G. Kshirsagar, S.Chand&Co.Edition (2010).
5. Fundamentals of Physics by Halliday, Wiley, India.

Reference Books:

1. Concepts of Modern Physics by Beiser, TMH, New Delhi.
2. Solid State Physics by Kittel,Wiley India.
3. Atomic and Nuclear physics by Brijlal and Subraminiyan.
4. LASERSs and Electro Optics by Christopher C. Davis, Cambridge Univ. Press (1996).
5. Optoelectronics an Introduction by J. Wilson &J.F.B.Hawkes, " Prentice-Hall II Edition.
6. LASER theory and applications by A. K. Ghatak&Tyagarajan, TMH (1984). 7. Optics by Ghatak, TMH.

List of Practical:

1. Measurement of radius of curvature "R" of convex lens by Newton"s ring experiment.
2. Measurement of Numerical aperture of fiber by LASER.
3. Determination of Energy band gap „Eg“ of Ge using Four Probe method.
4. Measurement of Frequency of A.C. mains by electrically maintained vibrating rod.
5. Measurement of Resolving Power of Telescope.
6. Measurement of "λ" of LASER light source using Diffraction Grating.
7. Determination of Planck"s constant by using photocell.
8. Determination of Energy band gap (Eg) using PN Junction Diode.
9. To determine the mass of cane sugar dissolved in water using half shade polarimeter.
- 10.To study forward and reverse characteristics of Zener diode.

S.5 Introduction to Computer Science and Engineering(BTCS-102)

UNIT I Introduction to Computer Fundamentals:

Introduction: What is Computer, Objectives, Hardware and software, Block Diagram of The Computer, Functions of the different Units, CPU(Central Processing Unit), Input unit,

Output unit, Memory, Storage Devices, Representation of data and information, Computer Languages, Machine language, Assembly language, High level language, Number System and Conversion, Classification of Computers, History and Generations of Computer, Types of Computers, Characteristics of Computers, Introduction to Free and Open Source Software, Definition of Computer Virus, Types of Viruses, Use of Antivirus software. Applications of Computers: Home, Education and Training, Entertainment, Science, Medicine, Engineering etc.

UNIT II The Operating System:

The Graphical User Interface (GUI), Definition of Operating System, Objective, Types and functions of Operating Systems, Windows Operating System, Installing MS Windows, Working with Windows Operating System, System Tools and Applications in windows, MS-DOS (Disk Operating System), Basic DOS commands, Switching Between DOS and Windows, Comparison of DOS and Windows, System Tools and Applications in MS-DOS, Other Operating Systems Unix, Linux etc.

UNIT III Office Automation Tools-I:

Word Processing Basics, Elements of word Processing and Working, MS-Office (Word, Access, Outlook, Front page etc), Objectives, Starting MS-Word, MS-Word Screen and its Components, Working with MS-Word, Menu Bar, Creating Documents, Using Templates, Saving a documents, Working with documents, Setting up pages of a document, Printing Documents with different options, Using Tables and Columns, Object Linking and Embedding, Hyperlink, Envelopes & Label Creation, Grammar & Spell Check, Mail Merge, Macro Creation, Previewing and Printing Documents.

UNIT IV Office Automation Tools-II:

**Spread Sheet: Introduction to MS-Excel, Starting MS-Excel, Basics of Workbook and Spreadsheet, MS-Excel Screen and Its Components, Features of Excel, Elementary Working with MS-Excel, Manipulation of cells, Formatting of Spreadsheet and Cells, Formulas and Functions, Spread sheets for Small accountings, Previewing and Printing a Worksheet.
Power-point: Introduction to MS-PowerPoint, Starting MS-PowerPoint, Basics of PowerPoint, MS PowerPoint Screen and Its Components, Features of PowerPoint, Elementary, Elementary Working with MS-PowerPoint, Preparation of Slides, Creation of Presentation, Providing aesthetics, Slide Manipulation and Slide Show, Presentation of the Slides.**

UNIT V Computer Communication and Internet:

Computers and Communication: Introduction to Computer Networks, Internet and World Wide Web, Communication and Collaboration(Electronic Mail), Basic of electronic mail, Web Browsers and Servers, Introduction to HTML, Use of Computer in Commerce, Internet Applications, Electronic Data Interchange, Electronic Payment System, Internet Security, Privacy, Ethical Issues & Cyber Law.

Text Books:

1. E Balagurusamy , “Fundamentals of Computers ”,TMH 2009.
2. Silakari and Shukla, “Basic Computer Engineering ”, Wiley India 2011.

3. V. Rajaraman, Neeharika Adabala, "Fundamentals of Computers", Sixth edition PHI 2015
4. Ajoy Kumar Ray and Tinku Acharya , " Basic Computer Engineering", PHI 2011.
5. P K Sinha , "Fundamentals of Computers " ,Fourth , BPB Publications, 2004. Reference

Books:

1. J. P. Tremblay and R.B. Bunt, "An Introduction of Computer Science –An Algorithmic Approach", TMH 2015.
2. Faith Wempen , "Computing Fundamentals: Introduction to Computers ", Wiley 2015.
3. Norton, Peter, "Introduction to Computers", Fourth revised ,Mc-Graw-Hill 2000.
4. Reema Thareja , "Fundamental of Computers", Oxford University Press, 2014.

List of Practical:

1. Study and Perform different MS –DOS Commands (Internal and External).
2. Create the "test" directory in the directory you are currently in using MS-DOS.
3. Study of Word – Templates, Styles.
4. Create a new user and give it Administrator privilege for Microsoft windows OS.
5. Create a MS-Word .doc file contain your complete CV.
6. Study and perform different Excel Commands/Functions.
7. Perform MS-Excel Accounting.
8. Create a MS-Excel .xls file contain mark sheet.
9. Display the student's result into a chart using MS-Excel.
10. Create a MS-Power Point Presentation .ppt file covers the topic "Computer's Evolution".
11. Create a MS-Power Point Presentation .ppt file covers the topic "social responsibility".
12. Create a MS-Access database .mdb file to store the results of students.
13. Study of various Network topologies.

S.6 Digital Logic and Circuit Design(BTEC-104)

UNIT I Number System & Codes:

Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1's Complement & 2 's Complement representation and their arithmetic operation, Floating point representation, binary codes, BCD,ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II Boolean algebra and Logic gates:

Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan's theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / Quine McCluskey method.

UNIT III Combinational logic:

Arithmetic circuits- Half adder, Full adder, Halfsubtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

UNIT IV Sequential logic:

Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V Semiconductor Memories and A/D and D/A converters:

Semiconductor Memory – RAM, ROM Organization, operation and their Types, PLD-PAL, PLA, PROM, FPGA, Analog to Digital (A/D)and Digital to Analog (D/A) converters and their types

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. S Salivahanan and S Arivazhagan: Digital Circuits and Design, 4th Edition, Vikas Publishing House, 2012.

Reference Books:

- A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI, 2016.
1. Floyd and Jain, "Digital Fundamentals", 10th Edition, Pearson Education India, 2011.
2. Roland J.Tocci, Widmer, Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson 2009.
7. Stephen Brown, Zvankovranesic, "Fundamentals of Digital Logic Design", 3rd Edition, McGraw Hill, 2017.

List of Practical:

1. To study and test of operation of all logic gates for various IC's (IC7400, IC7403, IC408, IC74332, IC7486).
2. Verification of DeMorgan's theorem.
3. To construct of half adder and full adder.
4. To construct of half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Design a BCD to excess 3 code converter.
8. Design a Multiplexer/ Demultiplexer
9. Analysis of various flip flops with Preset and Clear capability.
10. Design of Johnson and Ring counter.
11. Design of synchronous and asynchronous up/down counters.

S.7 Principles of 'C' language (BTCS-104)

UNIT I Introduction to Programming Languages:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals Of Algorithms, Flowcharts.

UNIT II Introduction to 'C' Language:

Character Set.Variables and Identifiers, Built-In Data Types. Variable Definition, Arithmetic Operators and Expressions, Constants And Literals, Simple Assignment Statement, Basic Input/Output Statement, Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement, Structured Programming.

UNIT III One Dimensional Arrays:

Array Manipulation; Searching, Insertion, Deletion of an Element from an Array; Finding the Largest/Smallest Element in an Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of a Square Matrix, Strings as Array of Characters, Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions And Pointers, Arrays And Pointers, Pointer Arrays.

UNIT IV Top-Down Approach of Problem Solving:

Modular Programming and Functions, Standard Library of C Functions, Prototype of a Function: Formal Parameter List, Return Type, Function Call, Block Structure, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions and Arrays as Function Arguments Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

UNIT V Concept of Files:

File Opening in Various Modes and Closing of a File, Reading from a File, Writing onto a File.

Text Books:

1. Tennece W.Pratt, “Programming languages design and implementation”, Prentice Hall of India.
2. Allen B. Tucker, “Programming Languages”, Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH publications.
4. Balagurusamy:,”Programming with C++”, ANSI C TMH

Reference Books:

1. Roosta- Foundation of Programming Languages,Vikas
2. Jeyapoovan- A First Course in Prog with C, Vikas 8. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
3. Fundamentals of Programming Languages, R. Bangia,Cyber Tech .
4. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB

- Sem 2

S.1 Mobile Application Development-II (BTCSMOB-201)

UNIT I Functions:

Defining and Calling Functions, Function Parameters and Return Values: Functions Without Return Values, Functions with Multiple Return Values, Optional Tuple Return Types Function Argument Labels and Parameter Names: Specifying Argument Labels, Omitting Argument Labels, Default Parameter Values, Variadic Parameters, Function Types, Function Types as Parameter Types.

UNIT II Closures and Enumeration:

Closure Expressions, Inferring Type From Context, Implicit Returns from Single-Expression Closures, Shorthand Argument Names, Operator Methods, Trailing Closures, Capturing Values, Escaping Closures.Enumeration : Enumeration , Enumeration with Switch Statement, Iterating Enumeration Cases , Associated Values, Raw Values, Recursive Enumerations.

UNIT III Structures and Classes:

Definition Syntax, Structure and Class Instances, Accessing Properties, Memberwise Initializers for Structure Types, Value types or Reference Types. Properties : Stored Properties, Lazy Stored Properties, Computed Properties, Property Observers. Global and Local Variables, Type Properties,Type Property Syntax, Querying and Setting Type Properties.

UNIT IV Method and Inheritance:

Methods, Instance Methods, self Property, Mutating Method, Type Methods Inheritance: Base Class,types of Inheritance, Subclassing, Overriding: Accessing Superclass Methods, Properties, and Subscripts, Overriding Methods, Overriding Properties, Overriding Property Getters and Setters, Preventing Overrides.

UNIT V Initializers:

Initializers, Default Property Values, Customizing Initialization, Initialization Parameters, Parameter Names and Argument Labels, Initializer Parameters Without Argument Labels, Optional Property Types, Default Initializers, Initializer Delegation for Value Types, Class Inheritance and Initialization, Initializer Inheritance and Overriding, Automatic Initializer Inheritance, Failable Initializers, Failable Initializers for Enumerations, Overriding a Failable Initializer.

Text Books:

1. Matthew Mathias, John Gallagher, Swift Programming: The Big Nerd Ranch Guide 2nd edition, 2015.
2. Matt Neuberg, iOS 12 Programming Fundamentals with Swift, O'Reilly; 5th edition.
3. App Development with Swift (as available on iBook Store).

Reference Books:

1. Paris Buttfield-Addison, Jonathon Manning , Tim Nugent Learning Swift: Building Apps for macOS, iOS, and Beyond, O'Reilly Media, Inc., 3rd ed, 2018.
2. Jon Hoffman, Mastering Swift 4, Packt Publishing Limited ,4th edition,2017.

3. Vandad Nahavandipoor. iOS 11 Swift Programming Cookbook, O'Reilly Media, 2017
4. S. Yamacli, Beginner's Guide to iOS 11 App Development Using Swift 4: Xcode, Swift and App Design Fundamentals,(1e), USA: CreateSpace Independent Publishing Platform, 2017.

List of Practicals:

1. Programs to demonstrate function with and without return type and parameters.
2. Program to demonstrate function returning multiple values.
3. Program to demonstrate function returning optional tuple.
4. Programs to demonstrate function with and without argument label.
5. Program to demonstrate Closures.
6. Program to demonstrate Single-Expression Closures.
7. Program to demonstrate Shorthand Argument Names.
8. Program to demonstrate Trailing Closures.
9. Program to demonstrate Enumeration
10. Program to demonstrate with Switch case.
11. Program to demonstrate Enumeration Associated values, Raw Values.
12. Program to demonstrate Structure .
13. Program to demonstrate Properties, Memberwise and Initializers for Structure Types.
14. Programs to demonstrate Stored Properties, Lazy Stored Properties, Computed Properties, and Property Observers.
15. Programs to demonstrate different types of Inheritance in Swift.
16. Programs to demonstrate Methods, Instance Methods, self Property and Mutating Method
17. Programs to demonstrate Accessing Superclass Methods, Properties, Overriding Methods and Overriding Properties.
18. Programs to demonstrate Initializers, Default Property Values and Custom Initializers.
19. Programs to demonstrate Initializer Inheritance , Overriding and Automatic Initializer Inheritance,
20. Programs to demonstrate Failable Initializers, Failable Initializers for Enumerations and Overriding a Failable Initializer.

S.2 Communication Skills (HUCS-101)

UNIT I Communication:

Nature, Meaning, Definition, Verbal and Non Verbal Communication Barriers to Communication.

UNIT II Basic Language Skills:

Grammar and usage- Parts of Speech, Tenses, S-V Agreement, Preposition, Article.

UNIT III Basic Language Skills:

Types of Sentence, Direct - Indirect, Active - Passive voice, Phrases& Clauses. UNIT IV Business Correspondence: Business Letter, Parts & Layouts of Business Resume and Job application, E-mail writing.

UNIT V Report Writing:

Importance of Report, Types of Report, Structure of a Report.

Text & Reference Books:

1. Ashraf Rizvi.(2005).Effective Technical Communication. New Delhi:Tata McGraw Hill
2. Adair, John (2003). Effective Communication. London: Pan Macmillan Ltd.
3. A.J.Thomson and A.V.Martinet(1991).A Practical English Grammar(4thed).New York: Oxford IBH Pub.
4. Kratz, Abby Robinson (1995). Effective Listening Skills. Toronto: ON: Irwin Professional Publishing.
5. Prasad, H. M.(2001) How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill.
6. Pease, Allan. (1998). Body Language. Delhi: Sudha Publications.

List of Practical:

1. Self-Introduction
2. Reading Skills and Listening Skills
3. Oral Presentation
4. Linguistics and Phonetics
5. JAM (Just a Minute)
6. Group Discussion

S.3 Programming Skills with 'C++' (BTCS-208)

UNIT I:

Object Oriented Programming: Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies.

UNIT II: Tokens, Expression and controls Structures:

Tokens , Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables. **Operators in C++ :** Scope resolution operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. **Functions:** The main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III: Class and Object:

Introduction, Specifying a Class, Defining Member Functions, C++ Program with Class, Nesting of Member functions, Private Member Functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructor and Destructor: Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, and

Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor, Operator overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators.

UNIT IV: Inheritance and Polymorphisms:

Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT V: I/O Operations and Files:

C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put(), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good().

Text Books:

1. E Balagurusamy, Object Oriented Programming with C++, 7Th Edition, Mc Graw Hill India, 2017.
2. Robert Lafore, Object Oriented Programming In C++, 4Th Edition, 2001.
3. David Parsons, Object Oriented Programming with C++; BPB publication, 2008.
4. Hubbard, Programming in C++ (Schaum), 3rd Edition, McGraw Hill Education, 2009.

Reference Books:

1. Herbert Schildt, The Complete Reference, 4th Edition, Tata McGraw-Hill Education Pvt. Ltd.,2000.
2. K R Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education, 2017.
3. Rajaram, R., Object Oriented Programming and C++, Second Edition, 2007
4. Saurav Sahay, Object Oriented Programming with C++, Oxford, 2006.

List of Practical:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76
2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.
3. Write a function using reference variables as arguments to swap the values of a pair of integers.
4. Write a macro that obtains the largest of 3 numbers.
5. Define a class to represent a bank account. Include the following members:
Data members
 1. Name of the depositor
 2. Account number
 3. Type of account
 4. Balance amount in the account

Member functions

- 1. To assign initial values**
- 2. To deposit an amount**
- 3. To withdraw an amount after checking the balance**
- 4. To display name and balance**

Write a main program to test the program.

7. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and odd one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

7. Design a constructor for bank account class.

8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message “Required copies not in stock” is displayed.

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.

9. Improve the system design in exercise 8 to incorporate the following features:

(a) The price of the books should be updated as and when required. Use a private member function to implement this.

(b) The stock value of each book should be automatically updated as soon as a transaction is completed.

(c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.

10. Design a C++ Class „Complex“ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

11. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class account that stores customer name, account number and type of account. From this derive the classes curacct and savacct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

- a) Accept deposit from a costumer and update the balance.**
- b) Display the balance**
- c) Compute and deposit interest.**
- d) Permit withdrawal and update the balance.**
- e) Check for the minimum balance, impose penalty, necessary and update balance.**

12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle

from the base shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it in the derived class to suit their requirements.

S.4 Object Oriented Programming (BTCS-305)

UNIT-I Introduction to OOP:

Abstract data types, Objects and classes, Attributes and Methods, Objects as software units, Encapsulation and Information hiding, Objects instantiations and interactions, Object lifetime, Static and dynamic objects, global and local objects, Metaclass, Modeling the real world objects.

UNIT-II Object and Classes:

Relationships between classes, Association of objects, Types of Association, Recursive Association, Multiplicities, Navigability, Named association, Aggregation of objects. Types of Aggregation, Delegation, Modeling Association and Aggregation.

UNIT-III OOP Concepts :

Inheritance and Polymorphism, Types of Polymorphism, Static and Dynamic Polymorphism, Operator And Method Overloading, Inherited Methods, Redefined Methods, The Protected Interface, Abstract Methods and Classes, Public and Protected Properties, Private Operations, Multiple Inheritance.

UNIT-IV I/O and File management:

Concept of Streams, Cin and Cout Objects, C++ Stream Classes, Unformatted and Formatted I/O, Manipulators, File Stream, C++ File Stream Classes, File Management Functions, File Modes, Binary And Random Files.

UNIT-V C++/Java:

Exception Handling , TypeCasting ,Templates function and class in C++, Comparison Between C++ and Java, Features of Java ,Introduction to java, Inheritance, Interface and Abstract class in Java.

TEXT BOOKS:

1. David Parsons; Object oriented programming with C++; Second edition; BPB publication; 1997.
2. Robert Lafore; Object oriented programming in C++ ; Fourth edition ; Pearson publication;2002 .
3. E Balagurusamy; Object oriented programming with C++; Seven edition; TMH; 2017.
4. Herbert Schildt ; Java Complete Reference;Seven edition; McGrawHill; 2006 .

REFERENCES:

- 1.John R Hubbard; Programming in C++ (Schaum); Third edition; TMH; 2000.
- 2.Venugopal; Mastering C++ ; second edition ;TMH; 2006.
- 3.Steven Holzner; C++ Programming Black Book; First Edition; Coriolis Group,U.S;2001.

4.E Balagurusamy; Programming with java a primer; Fourth edition; TMH ; 2011.

S.5 Mathematics-II (BTMACS-201)

UNIT I Calculus of Matrices:

Systems of linear equations and their solutions. Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices.

UNIT II Differential Equation:

Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

UNIT III Numerical Analysis Interpolation and Curve Fitting:

Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton-Gregory Polynomial Form; Lagrange Polynomial Interpolation; Approximation by Least Square Method. Numerical Differentiation and Integration: Discrete Approximation of Derivatives: Forward and Backward Difference Forms, Numerical Integration, Simple Newton-Cotes Rules: Trapezoidal and Simpson's (1/3) Rules; Weddle's Rule.

UNIT IV Numerical Solution of ODE:

Euler's Method for Numerical Solution of ODE; Modified Euler's Method; Runge-Kutta Method (RK2, RK4); Multistep Method: Predictor-Corrector method.

UNIT V Probability Theory and Random Process:

Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, Poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains.

Text Books:

1. G. Strang, **Linear Algebra And Its Applications**, 4th Edition, Brooks/Cole, 2006
2. S. L. Ross, **Differential Equations**, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, **An Introduction to Ordinary Differential Equations**, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, **Elementary Differential Equations and Boundary Value Problems**, 7th Edition, Wiley, 2001.
5. K. E. Atkinson, **Numerical Analysis**, John Wiley, Low Price Edition (2004).
6. S. D. Conte and C. de Boor, **Elementary Numerical Analysis - An Algorithmic Approach**, McGraw-Hill, 2005.
7. B. S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers, Delhi

Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley, 2005.
2. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.
3. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
4. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.
5. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, 2001.
6. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
7. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill 2008.

S.6 Computer Peripherals and Interfaces (BTCS-204)

UNIT I Memory:

Introduction to memory and its use, Memory chips and Modules: DIPP, SIPP, SIMM, DIMM, SO-DIMM, RIMM, Parity checking and ECC, ROM and its types, RAM and its types, Trouble shooting of Memory, Advanced Memory technologies: RDRAM, DDRAM, PRAM, VRAM.

UNIT II Motherboard:

Motherboard Controllers and System Resources, I/O System Bus: ISA, MCA, ELSA, VESA local bus, PCI, AGP, PCIX, Onboard I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS settings, Motherboard Form factor: AT and ATX Motherboard, LPX and NLX form factor.

UNIT III Power Supply:

Power Supply Functions and Operations, Power Supply Quality and Specifications, Power Supply and Form factors, Ventilation and Cooling: Fan, Processor cooling, Temperature limits, Power Problems and procedures, Power protection devices, Back-up power system.

UNIT IV Interfaces and I/O Ports:

Floppy Disk interface: Controller, Power cable, Control/Data cable, IDE interfaces: ATA standards, Master/Slave Configuration, Data transfer modes, SCSI interface: Bus, Standards, Hardware's, which is better SCSI or IDE, Serial ports, Parallel ports, USB, Troubleshooting.

UNIT V Device Drives and Peripherals:

Magnetic Storage: Reading/Writing, hard disk drives, Floppy disk drives, Optical Storage devices: CD-ROM drive, DVD-ROM drive, Keyboard: layouts, interfaces, Pointing devices, Mouse, Monitors, Printers, Troubleshooting of device drivers and peripherals.

Text Books:

- 1.Craig Zacker& John Rourtre, PC Hardware- The complete reference,First Edition, TMH, 2017
- 2.S.K. Chauhan, PC Upgrading, maintenance and troubleshooting guide, First Edition,
3. B. Govindarajalu, IBM PC and CLONES: Hardware, Troubleshooting and Maintenance McGraw Hill Education, 2nd Edition 2002
- 4.Mark Minasi, The Complete PC Upgrade and Maintenance Guide, Sixteenth edition Wiley, 2005
- 5.Mike Meyers, Introduction to PC Hardware and Troubleshooting, 1st edition, McGraw Hill Education, 2017

Reference Books:

1. Stephen Bigelow, Bigelow's Troubleshooting, Maintaining & Repairing PCs, 5 edition, McGraw Hill Education, 2017
2. Manahar Lotia, Pradeep Nair, Payal Lotia, Modern Computer Hardware Course, Second Revised Edition, BPB Publications, 2007
3. Vikas Gupta, Comdex Hardware and Networking Course Kit: Revised & Upgraded, Dreamtech Press, 2014
4. Dan Gookin, Troubleshooting and Maintaining Your PC All-in-One For Dummies, 3rd edition, John Wiley & Sons, 2017
5. Robert Bruce Thompson, Barbara Fritchman Thompson, Building the Perfect PC, 3 edition, O'Reilly, 2010

List of Practical:

1. To study and demonstrate the motherboard.
2. To study microprocessor and its types.
3. To study Back Power Supply: SMPS and UPS.
4. To study the Optical Drives: CD-ROM and DVD-ROM.
5. To study the working principle of keyboard and mouse.
6. To study different types ports and slots on board.
7. To study various types of Cables and their Connectors.
8. To study the working principle of monitor.
9. To study different types of printers.
10. To study the process of assembling a Motherboard.
11. To study working of Floppy Disk Drive.

S.7 Data Structure and Algorithms (BTCS-403)

UNIT I Introduction:

Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations.
Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays.
Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

UNIT II Linked List:

Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

UNIT III Stack:

The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi. The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV Tree:

Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion. Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V Sortings:

Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

Text books:

- 1.Ashok N. Kamthane, “Introduction to Data structures”, 2nd Edition, Pearson Education India,2011.
2. Tremblay & Sorenson, “Introduction to Data- Structure with applications”, 8th Edition, Tata McGrawHill,2011.
3. Bhagat Singh & Thomas Naps, “Introduction to Data structure”, 2nd Edition, Tata McGrawHill 2009.
4. Robert Kruse, “Data Structures and Program Design”,2nd Edition,PHI,1997.
5. Lipschutz Seymour,”Data structures with C” ,1st Edition ,Mc- GrawHill,2017.

Reference Books:

1. Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.
2. ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.
3. E. Balagurusamy ,”Data Structure Using C” ,Tata McGraw-Hill 2017.

4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015
5. Gav Pai, Data Structures, Tata McGraw-Hill, 2015.

List of Practical:

1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.
3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list
10. Program for implementation of Bubble sort
11. Program for Insertion sort
12. Program for Merge Sort
13. Program to implement Heap sort
14. Program to implement Quick sort
15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. To develop an algorithm for binary tree operations and implement the same.
17. To design an algorithm for sequential search, implement and test it.
18. To develop an algorithm for binary search and perform the same.

- Sem 3

S.1 Web Development Lab-I(HTML & XML) (BTIT-307)

UNIT I Introduction to HTML:

What is HTML, HTML Documents, SGML, Basic structure of an HTML document, creating an HTML document, Headers tags, Body tags, Paragraphs formatting, Text Elements, Tag Elements, Special Character elements, Image tags, HTML Table tags and lists: Numbered list, Non- Numbered lists, Definition lists, Anchor tag, Name tag, Hyperlinks – FTP/HTTP/HTTPS, Links with images and buttons, Links to send email messages, Text fonts and styles, background colors/images, Marquee Behavior, Forms related tags. (Action, method, name, inputetc.)

UNIT II HTML5:

Introduction of HTML5, Browser supports, Migration from HTML4 to HTML5, New Elements in HTML5, HTML5 different parts layout of a web page, HTML5 Graphics: Canvas, SVG, HTML Media Tags: Inserting audio files, Inserting video files, Screen control attributes, Media control attributes, HTML Object.

UNIT III CSS:

Introduction of CSS, CSS Syntax CSS Id & Class. CSS Styling: styling Backgrounds, styling Text, styling Fonts, styling Links, styling Lists, styling Tables. CSS Box Model: Border, Outline, Margin, Padding. CSS Advanced: Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image capacity, Image Sprites, Media Types, and Attribute Selectors.

UNIT IV XML:

Introduction of XML, Cross scripting of XML, XML as intermediate language, Difference between XML and HTML, XML DOM, Tree, Syntax, Elements, Attributes, Namespaces, XPath, XML DTD, Applications, XQuery, XML Schema, XML Parser, XHTML: Introduction of XHTML, XHTML rules over the HTML, conversation HTML to XHTML.

UNIT V Java Script:

Introduction to client side scripting, Server side scripting, Java Script Syntax, Variables and Functions, Operators: JavaScript Arithmetic Operators, JavaScript Assignment Operators, JavaScript Popup Boxes, JavaScript Window, Events and Objects, JavaScript Function Call, Validation in webpages, Introduction of AJAX

Text Books:

1. Jennifer Niederst Robbins. Learning Web Design, Fifth Edition, O'Reilly Media, Inc, May 2018.
2. Frain and Ben. Responsive Web Design with HTML5 and CSS3, Second Edition, 2015.
3. Nicholas c.Zakas. Java Script for Web Developers, Third edition, 2012.
4. George Q. Huang, K. L Mak. Internet Applications in Product Design and Manufacturing, ISBN: 3540434658, 2003 edition, springer, 2012.

Reference Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible", Fifth Edition, WileyIndia, 2010.
2. John Duckett,"Beginning HTML, XHTML, CSS, and JavaScript ",WileyIndia, 2010.
3. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design",3rd edition, Wiley India, 2011.
4. Achyut S. Godbole, Atul Kahate, Web Technologies, ISBN: 9781259062681,3rd edition, TMH, 2013.

List of Practical:

1. Design a Web Page, Insert an image on to the web page such that image is of height 300 and width 300 pixels. The image should have an ALT text in it.
2. Create a Web page that holds a bulleted list of the names of your friends. Make sure that the bullets are in plain circle.
3. Create a Frame which would hold both the web page that was created earlier. The frame should be split row-wise into equal halves.

4. Create a Web Page to display the marks you got in all subjects of last semester using table.
5. Create a Form having two boxes with labels as First Name and Last Name. The User should not be allowed to enter the names directly in the text boxes. The input has to be given in the prompt box and then entered values should be given in the textboxes.
6. Create a Web Page that has a button in the center of the page. Using mouse events change the Message in the statusbar.
7. Design a Web page that accepts Username and Password. Opens a new window when the password corresponds to a particular value is set by the developer
8. Design a Web page that consists of 2 text boxes. When the page is first loaded set the focus to the first textbox. The user should not be allowed to leave the box unless enters a value in it.
9. To convert the HTML code to XHTML code.
10. To study the XML tree.
11. To study of Dreamweaver Tool.
12. To study of a Flash Animation Tool.

S.2 Mobile App Development III iOS (BTCSMOB-301)

UNIT-I Introduction:

Introduction to iOS, Mobile application development, Overview of iOS platform, setting up Xcode & tools, MVC design pattern. Interface Builder Basics: Common system views, Interface Builder Storyboards, project options, default project, create a new project with label and a greet function.

UNIT-II Introduction to UIKit:

Common system views configuration, Label(UILabel),Image view,Text view,Scroll view, Table view, Toolbars(UIToolbar), Navigation bars, tab bars, Controls, Button, Segmented controls, Sliders, Switches, Date pickers, UIKit User Interface Catalog, Displaying data: Content mode, Unexpected Clipping.

UNIT-III Auto Layout and Stack Views:

Layout for multiple sizes, Why Auto Layout?, Create alignment constraints, create size constraints, Resolve constraint issues, Safe area layout guide ,resolve constraint warnings, Constraints between siblings, Stack views,stack view attributes, Size classes.

UNIT-IV App Anatomy and Life Cycle:

App life Cycle, break down the delegate, Protocols methods: Did Finish Launching, Will Resign Active, Did Enter Background, Will Enter Foreground, Did Become Active, Will Terminate. View Controller life Cycle: viewDidLoad, viewWillAppear , viewWillDisappear, viewWillAppear.

UNIT-V User Interactivity and Advanced UI Concepts:

Gestures, Extensions, Delegation, Protocols, Closures, Handling Touches. Basic iOS Animations: Timer, view based animations, UI dynamics , Alerts, Actions Sheets, Notifications, Segues. Persistence and Documents: User defaults, Core data, property list, Archiving and Codable, File system, File Manager & CloudKit, Working with the web.

Text Books:

1. Matthew Mathias, John Gallagher, Swift Programming: The Big Nerd Ranch Guide 2nd edition, 2015.

2. Matt Neuberg , iOS 12 Programming Fundamentals with Swift, O'Reilly; 5th edition.
3. App Development with Swift (as available on iBook Store)

Reference Books:

1. Paris Buttfield-Addison, Jonathon Manning , Tim Nugent Learning Swift: Building Apps for macOS, iOS, and Beyond, O'Reilly Media, Inc., 3rd ed, 2018.
2. Jon Hoffman, Mastering Swift 4, Packt Publishing Limited ,4 th edition, 2017.
3. Vandad Nahavandipoor. iOS 11 Swift Programming Cookbook, O'Reilly Media, 2017
4. S. Yamacli, Beginner's Guide to iOS 11 App Development Using Swift 4: Xcode, Swift and App Design Fundamentals,(1e), USA: CreateSpace Independent Publishing Platform, 2017.

List of Practicals:

Perform Experiments on each Topic at least 20 Experiments are suggest to Cover the Syllabus.

1. Create an Hello world App.
2. Create an App Using Labels and Buttons.
3. Create an Calculator App using Textviews , Labels and Buttons to perform different mathematical operations.
4. Create an App to demonstrate ImageViwer.
5. Create an App to demonstrate Scrollview.
6. Create an App to demonstrate Tableview.
7. Create an App to demonstrate Toolbar.
8. Create an App to demonstrate Slider.
9. Create an App to demonstrate Switches.
10. Create an App to demonstrate DatePicker.
11. Create an App Using Auto Layout.
12. Create an App Using Constraints.
13. Create an App to demonstrate Lifecycle of an App.
14. Create an App to demonstrate ViewController Lifecycle.
15. Create an App to demonstrate User Interactivity and Advanced UI Concepts.
16. Create different apps using Timer, Alerts, Actions Sheets and Notifications.
17. Create different apps using view-based animations, UI dynamics and Segues.
18. Create different apps using File system, File Manager & CloudKit.
19. Design and Implement an App.

S.3 Introduction to Core Java (BTIT-309)

UNIT I The Java Environment:

Basic History of Java and its Features, JVM, JRE and JDK, its Libraries and Functionalities, Why Java? Installing Java, Java Classes and Objects, Variables and Data Types Conditional and Looping Constructs, Arrays.

UNIT II The Java Language:

Constructors, Inheritance, Packages and Interfaces, Access Specifier, Enumerations, Auto boxing, and Annotations (Metadata) Garbage collection, Nested Classes, Inner Classes

UNIT III Performance:

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, The Idea Behind Exception, Exceptions and Errors, Types of Exception, Control Flow in Exceptions, JVM Reaction to Exceptions, Use of Try, Catch, Finally, Throw, Throws in Exception Handling, In-Built and User Defined Exceptions, Checked and Un Checked Exceptions, Generics, Lambda Expressions.

UNIT IV The Java Library:

String Handling, Exploring Java.Lang, Java.Util – The Collection Framework, Exploring Java.IO, Exploring Java. NIO.

UNIT V Database Connectivity with JDBC:

Introduction to JDBC, JDBC Drivers & Architecture, CRUD Operation using JDBC

Text Books:

1. Kishore Sharan, “Beginning Java 8 Language Features”, Apress, 2014
2. E. Balagurusamy, “Programming with java A Primer”, Fourth Edition, Tata McGraw Hill, 2009.
3. Sharanam Shah, “Core Java 8 for Beginners”, Shroff Publisher, 2015.

Reference Books:

1. Herbert Schildt, “The Complete Reference Java”, Ninth Edition, McGraw Hill, 2014
2. Bert Bates, Kathy Sierra, “Head First Java”, 2nd Edition, O’ Reilly, 2005
3. Cay S Horstman and Gary Cornell, “Core Java”, Vol I & II, Pearson Education, 2013

List of Practical:

1. Write a program to show concept of Class in Java?
2. Write a program showing Type Casting
3. Write a program showing Different type of inheritance
4. Write a program showing Different types of Polymorphism
5. Write a program showing Encapsulation
6. Write a program showing Abstraction
7. Write a Multithreaded program
8. Write a program showing Checked and Unchecked Exception
9. Write a program showing Database connectivity.
10. Write a program showing Simple database Operation (CRUD)

S.4 Principles of Programming Languages (BTCS-303)

UNIT I Preliminary Concepts:

Reasons for Studying, Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming , Logic Programming. Programming Language Implementation – Compilation and Virtual Machines, Programming Environments.

UNIT II Data Types:

Introduction, Primitive, Character, User Defined, Array, Associative, Record, Union, Pointer and Reference Types, Design and Implementation Uses Related to these Types. Names, Variable, Concept of Binding, Type Checking, Strong Typing, Type Compatibility, Named Constants, Variable Initialization.

UNIT III Expressions and Statements:

Arithmetic Relational and Boolean Expressions, Short Circuit Evaluation Mixed Mode Assignment, Assignment Statements, Control Structures – Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, Guarded Commands.

UNIT IV Subprograms and Blocks:

Fundamentals of Sub-Programs, Scope and Lifetime of Variable, Static and Dynamic Scope, Design Issues of Subprograms and Operations, Local Referencing Environments, Parameter Passing Methods, Overloaded Sub-Programs, Generic Sub-Programs, Design Issues for Functions Overloading and Overloaded Operators, Co-Routines.

UNIT V Abstract Data Types:

Abstractions and Encapsulation, Introductions to Data Abstraction, Static and Stack Based Storage Management. Heap Based Storage Management. Garbage Collection. Object Oriented Programming in Smalltalk, C++, Java, C#, Php, Perl. Concurrency: Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, C# Threads.

Text Books:

1. Robert .W. Sebesta —Concepts of Programming Languages®, 10th Edition, Pearson Education,2008.
2. D. A. Watt, —Programming Language Design Concepts, Wiley dreamtech, rp-2007.
3. Louden and Lambart,—Programming Languages: Principles and Practices®, 3rd Edition, Cengage Learning, 2011

Reference Books:

1. Gabbrielli and Martini —Programming Languages: Principles and Paradigms., Springer, 2010.
2. Peter Sestoft,—Programming Language Concepts®, Springer, 2017.
3. A.B. Tucker, R.E. Noonan, —Programming Languages®, 2nd Edition, Tata McGraw Hill.
4. Terrance W Pratt, "Programming Languages: Design and Implementation" Pearson Education.

List of Practical:

1. Type compatibility rules of a C compiler.
2. Compare time efficiency to run for matrix multiplication with and without subscript range checking.
3. Investigate the safety of enumeration types. Perform at-least 5 operations to determine what incorrect or silly things are legal.
4. Calculate time efficiency for large number of references to two dimensional array between subscripting and pointer arithmetic
5. Illustrates the order of evaluation of expressions used as actual parameters to a method.

6. Consider the following programming problem: The values of three integer variables—first, second, and third—must be placed in the three variables max, mid, and min, with the obvious meanings, without using arrays or user-defined or predefined subprograms. Write two solutions to this problem, one that uses nested selections and one that does not. Compare the complexity and expected reliability of the two.
7. Produces different behavior depending on whether pass-by-reference or pass-by-value result is used in its parameter passing.
8. Write a program in some language that has both static and stack dynamic local variables in subprograms. Create six large (at least $100 * 100$) matrices in the subprogram—three static and three stack dynamic. Fill two of the static matrices and two of the stackdynamic matrices with random numbers in the range of 1 to 100. The code in the subprogram must perform a large number of matrix multiplication operations on the static matrices and time the process. Then it must repeat this with the stack-dynamic matrices. Compare and explain the results.
9. Write an abstract data type for complex numbers, including operations for addition, subtraction, multiplication, division, extraction of each of the parts of a complex number, and construction of a complex number from two floating-point constants, variables, or expressions.
10. Define semaphores in Ada and use them to provide both cooperation and competition synchronization in the shared-buffer example
11. Prepare a case study on C and C++ for Readability, Writability and. Reliability

S.5 Discrete Structures (BTIT-401)

UNIT I Set Theory:

Definition Of Sets, Venn Diagrams, Complements, Cartesian Products, Power Sets, Counting Principle, Cardinality and Countability (Countable And Uncountable Sets), Proofs of Some General Identities on Sets, Pigeonhole Principle. Relation: Definition, Types of Relation, Composition of Relations, Domain and Range of a Relation, Pictorial Representation of Relation, Properties of Relation, Partial Ordering Relation. Function: Definition and Types of Function, Composition of Functions, Recursively Defined Functions.

UNIT II Propositional Logic:

Proposition Logic, Basic Logic, Logical Connectives, Truth Tables, Tautologies, Contradiction, Normal Forms (Conjunctive and Disjunctive), Modus Ponens and Modus Tollens, Validity, Predicate Logic, Universal and Existential Quantification. Notion of Proof: Proof by Implication, Converse, Inverse, Contrapositive, Negation, and Contradiction, Direct Proof, Proof by Using Truth Table, Proof by Counter Example

UNIT III Graph Theory:

Terminology Graph Representation Graph Isomorphism; Connectedness; Various Graph Properties; Euler and Hamiltonian Graph; Shortest Paths Algorithms. Trees: Terminology, Tree Traversals; Prefix Codes, Spanning Trees, Minimum Spanning Trees.

UNIT IV Algebraic Structure:

Binary Composition and its Properties Definition of Algebraic Structure; Groyas Semi Group, Monoid Groups, Abelian Group, Properties of Groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (Definition and Standard Results).

UNIT V Posets, Hasse Diagram And Lattices:

Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded and Complemented Lattices.
Combinatorics: Introduction, Permutation and Combination, Binomial Theorem, Multinomial Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive Algorithms, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions, Generating Functions, Solution by Method of Generating Functions.

Text Books:

1. C.L.Liu, "Elements of Discrete Mathematics", 4th Edition, Tata McGraw-Hill, 2012.
2. Kenneth H. Rosen, "Discrete Mathematics and its applications", 7th Edition, Tata McGraw-Hill, 2012.
3. V. Krishnamurthy, "Combinatorics: Theory and Applications", 2nd Edition, East-West Press, 2008.
4. Seymour Lipschutz, M. Lipson, "Discrete Mathematics", 3rd Edition, Tata McGraw Hill, 2009.

Reference Books:

1. Trembley, J.P & Manohar; "Discrete Mathematical Structure with Application CS", Tata McGraw Hill.
2. Bisht, "Discrete Mathematics", Oxford University Press, 2015.
3. Biswal, "Discrete Mathematics & Graph Theory", 3rd Edition, PHI, 2011.

S.6 Data Communication (BTCS-302)

UNIT I Introduction:

Data Communication Components, Types of Connections, Transmission Modes, Network Devices, Topologies, Protocols and Standards, OSI Model, Transmission Media, Bandwidth, Bit Rate, Bit Length, Baseband and Broadband Transmission, Attenuation, Distortion, Noise, Throughout, Delay and Jitter.

UNIT II Data Encoding:

Unipolar, Polar, Bipolar, Line and Block Codes. Multiplexing: Introduction and History, FDM, TDM, WDM, Synchronous and Statistical TDM. Synchronous and Asynchronous transmission, Serial and Parallel Transmission.

UNIT III Error Detection & Correction:

Correction, Introduction–Block Coding–Hamming Distance, CRC, Flow Control and Error Control, Stop and Wait, Error Detection and Error Go Back–N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, CSMA/CD, CDMA/CA

UNIT IV Network Switching Techniques:

Circuit, Message, Packet and Hybrid Switching Techniques.X.25, ISDN.Logical Addressing, Ipv4, Ipv6, Address Mapping, ARP, RARP, BOOTP and DHCP, User Datagram Protocol, Transmission Control Protocol, SCTP.

UNIT V Application Layer Protocols:

Domain Name Service Protocol, File Transfer Protocol, TELNET, WWW and Hyper Text Transfer Protocol, Simple Network Management Protocol, Simple Mail Transfer Protocol, Post Office Protocol v3.

Text books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw Hill, 2011.

Reference Books:

1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Fifth Edition, Elsevier, 2012.
2. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.
3. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

S.7 Analysis and Design of Algorithms (BTIT-305)

UNIT 1 Algorithms Designing:

Algorithms, Analyzing Algorithms, Asymptotic Notations, Heap and Heap Sort, Brief Review of Graphs, Sets and Disjoint Set Union, Sorting and Searching Algorithms and their Analysis in terms of Space and Time Complexity. Divide and Conquer: General Method, Binary Search, Merge Sort, Quick Sort, Selection Sort, Strassen’s Matrix Multiplication Algorithms.

UNIT II Greedy Method:

General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths. UNIT III Dynamic Programming: General Method, Optimal Binary Search Trees, O/1 Knapsack, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV Backtracking:

General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets. Branch and Bound: Method, O/1 Knapsack Problem, Traveling Salesperson Problem, Efficiency Considerations, Techniques for Algebraic Problems, Some Lower Bounds on Parallel Computations.

UNIT V NP Hard and NP Complete Problems:

Basic Concepts, Cook’s Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamental of Computer Algorithms", 2 nd Edition, Galgotia Publication, 2001.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest "Introduction to Algorithms", 3rd Edition, MIT Press, 2009.
3. Donald E Knuth, "Fundamentals of Algorithms: The Art of Computer Programming" Vol I, 3rd Edition, Pearson Education, 1997.

Reference Books:

1. Goodman, S.E. & Hedetniemi, "Introduction to Design and Analysis of Algorithm", Tata McGraw Hill, 1977.
2. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms", Tata McGraw Hill, 2006.
3. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms" TMH Publication.
4. Michael T Goodrich and Roberto Tamassia "Algorithm Design", Wiley India.

List of Practical:

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for minimum spanning trees using Kruskal's algorithm.
6. Write a program for minimum spanning trees using Prim's algorithm.
7. Write a program for single sources shortest path algorithm.
8. Write a program for Floyd-Warshall algorithm.

9. Write a program for traveling salesman problem.
10. Write a program for Hamiltonian cycle problem.

• Sem 4

S.1 Unix and Shell Programming Lab (BTIT-406)

UNIT-I Introduction to UNIX –

The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal and External Commands, Command Structure. General purpose utilities: cal, date, echo, printf, bc, script, passwd, path, who, uname, tty, stty, pwd, cd, mkdir, rmdir, od.

UNIT-II Handling Files and C Environment –

The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount, chmod, The vi editor , security by file Permissions. Networking commands: ping, telnet, ftp, finger, arp, rlogin. The C compiler, vi editor, compiler options, and run the programs.

UNIT-III: Shell Basics –

Types of shells, Shell Functionality, Work Environment, Writing script & executing basic script, Debugging script, Making interactive scripts, Variables (default variables),

Mathematical expressions. Conditional statements: If-else-elif, Test command, Logical operators - AND, OR, NOT, Case –esac. Loops: While, For, Until, Break & continue.

UNIT-IV: Command Line Arguments & Regular Expression –

Command line arguments, Positional parameters, Set & shift, IFS. Functions & file manipulations: Processing file line by line, Functions. Regular Expression & Filters: Regular expression, Grep, cut, sort commands, Grep patterns.

UNIT-V: SED and AWK –

SED, Scripts, Operation, Addresses, commands, Applications, grep and sed. AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

Text Books:

1. Stephen Prata “Advanced UNIX: A Programming's Guide”, BPB Publications, 2017.
2. Maurice J. Bach “Design of UNIX O.S. ”, PHI Learning, 2015.
3. Brian W. Kernighan & Robe Pike, “The UNIX Programming Environment”, PHI Learning, 2015.
4. Sumitabha Das: “YOUR UNIX – The Ultimate Guide”, Tata McGraw Hill, 23rdreprint, 2012.
5. Yashavant Kanetkar, “Unix Shell programming”, 1st Edition, BPB Publisher, 2010.

Reference Books:

1. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and Shell Programming”, 1st Edition, Cengage Learning India, 2003.
2. Graham Glass, King Ables, “Unix for programmers and users”, 3rd Edition, Pearson Education, 2009.
3. Sumitabha Das, “Unix Concepts and Applications”, 4th Edition. TMH, 2006.
4. N.B. Venkateswarlu, “Advanced Unix programming”, 2nd Edition, B S Publications, 2010.

List of Practical:

1. Perform installation of UNIX/LINUX operating system.
2. Study of UNIX general purpose utility commands.
3. Execution of various file/directory handling commands.
4. Working with the vi editor: Creating and editing a text file with the vi text editor using the standard vi editor commands.
5. Write a shell script for calculator (to perform basic arithmetic and logical calculations).
6. Write a shell script sum.sh that takes an unspecified number of command line arguments (up to 9) of ints and finds their sum. Modify the code to add a number to the sum only if the number is greater than 10.
7. Write a shell script that will take an input file and remove identical lines (or duplicate lines from the file).
8. Write a shell script takes the name a path (eg: /afs/andrew/course/15/123/handin), and counts all the sub directories (recursively).
9. Shell scripts to explore system variables such as PATH, HOME etc.

10. Write a shell script that takes a name of a folder as a command line argument, and produce a file that contains the names of all sub folders with size 0 (that is empty sub folders)
11. Execution of various system administrative commands.
12. Write awk script that uses all of its features.
13. Write a shell script to display list of users currently logged in.
14. Write a shell script to delete all the temporary files.
15. Write a shell script to search an element from an array using binary searching.
16. Write shell script to perform different string operations of arrays.

S.2 Mobile Application Development IV Android (BTCSMOB-401)

UNIT-I Introduction:

Android overview, features, history and versions, API levels, Installation of Android Studio, configuring Android studio and Create Virtual Device, Dalvik Virtual Machine.

UNIT-II Getting Started:

Android Resources, Activities, Activity Life Cycle, Services, Intent, Types of Intent, layouts, Building a basic app , Android Studio folder structure and Useful files ,Edit code , Creating an Android Virtual Device, Run the app in the emulator.

UNIT-III Android Widget:

UI Widgets , Working with Button class and methods ,Button with Listener, Toast ,Toast Class and methods, Custom Toast, ToggleButton, ToggleButton Class and methods, checkbox class and methods, custom Checkbox, Radio Button, RadioGroup, Dynamic RadioButton ,Custom RadioButton, AlertDailog class and methods,Spinner.

UNIT-IV Advanced Widget:

AutoCompleteTextView, ListView RatingBar, WebView, SeekBar, DatePicker, TimePicker analog and Digital,ProgressBar, ScrollView Vertical and Horizontal, ImageSwitcher,ImageSlider, TabLayout , Tablayout with FrameLayout, SearchView, SearchView on Toolbar , EditText with TextWatcher.

UNIT-V Android Storage and SQLite:

Storage:Preferences , Internal Storage and External Storage. SQLite: SQLiteOpenHelper class and methods, SQLiteDatabase class and methods.

Text Books:

1. **Android Programming: The Big Nerd Ranch Guide** (Big Nerd Ranch Guides)
2. **Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps**

References:

1. <http://www.tutorialspoint.com/android/>
2. <http://www.programiz.com/android>
3. Head First Android Development: Dawn Griffiths, 2015, O'Reilly

List of Practical:

Perform Experiments on each Topic at least 20 Experiments are suggest to Cover the Syllabus.

- 1. Create a Hello world App.**
- 2. Create an App Using Labels and Buttons.**
- 3. Create an Calculator App using Textviews , Labels and Buttons to perform different mathematical operations (using action listner).**
- 4. Create an App to demonstrate Lifecycle of an App.**
- 5. Create an App to demonstrate ImageViwer.**

- 6. Create an App to demonstrate Toast.**
- 7. Create an App to demonstrate Checkbox.**
- 8. Create an App to demonstrate Radiobutton.**
- 9. Create an App to demonstrate AlertDialog.**
- 10. Create an App to demonstrate Autocomplete Text view.**
- 11. Create an App to demonstrate Listview.**
- 12. Create an App Using Datepicker and Timepicker.**
- 13. Create an App Using Constraints.**
- 14. Create different apps for each Layout.**
- 15. Create an app to demonstrate searchview.**
- 16. Create an App to demonstrate database connectivity using SQLite.**

S.3 Advanced Java programming (BTCS-409)

UNIT-I

J2EE Event Handling & GUI Design Event handling, AWT: Windows, Graphics, Text, AWT Controls, Layout Managers, and Menus, Images, GUI Programming with Swing, Exploring Swing, Swing Menu

UNIT-II

Java Servlet Overview, Servlet Interface, Request, Servlet context, response, Session, Dispatching request, Web Application

UNIT-III

JDBC Standard Extension 2.0 Introduction to databases (SQL ,No - SQL) Connecting to Databases – JDBC principles – Databases access – Interacting – Database search – Database support in Web applications MySQL , Model View Controller, JSP , HTML , CSS. UNIT-IV ORM and J2EE Frameworks: Introduction to Frameworks:- Struts, Spring basics, Spring AOP , Introduction to JavaScript and JQuery.

UNIT-V Advance J2EE Topic:

JavaMail 1.2(Sending and Receiving Mail, Mail body design, different components), Java Messaging Service (JMS) 1.0.2 (Architecture, Programming Model, Connection, Session, Producer, Consumer), Java API for XML Parsing (JAXP) 1.1 (Introduction, Parsing and XML, when to use SAX)

TEXT BOOKS:

- 1. Arnold, Ken, James Gosling, and David Holmes. The Java programming language. Addison Wesley Professional, 2005.**
- 2. Keogh, James. "The Complete Reference J2ME." published by McGrawHill OSBORNE Edition (2003)..**

3. Allamaraju, Subrahmanyam, et al. "Professional Java Server Programming J2EE 1." (2001).
4. Deshmukh, Hanumant, and JigneshMalavia. SCWCD exam study kit: Java web component developer certification. Manning Publications Co., 2002.
5. Cay, Horstmann, and Cornell Gary. "Core Java 2, Volume II–Advanced Features." (2005)

REFERENCE BOOKS:

1. Kito D. Mann, "Java Server Faces in Action", 2nd Edition, Dreamtech Press , 4 January 2005
2. Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley, "JDBC™ API Tutorial and Reference" Third Edition, Addison Wesley, 11 June 2009).
3. GiulioZambon , "Beginning JSP, JSF and Tomcat", 2nd Edition , Apress ,29 September 2012.
4. AnghelLeonard , "JSF2.0 CookBook" ,3rd Edition , PACKT publication ,2010.
5. Bryan Basham, Kathy Sierra & Bert Bates, "Head First Servlets and JSP" , 3rd Edition , O'Reilly Media,2012.

LIST OF EXPERIMENTS:

1. How to set up multiple panels, compound borders, combo boxes.
 2. Write a Program to implement Event handling.
 3. Write a Program to develop Java Servlet and use request and response
 4. Write a Program which allows the user to enter data in a jsp form and display in webpage
 5. Show basic JDBC operation
 6. Create Servlet file which contains following function:
 - 1) Connect
 - 2) Create Database
 - 3) Create table
 - 4) Insert records into respective table
 - 5) Update records of particular table of database
 - 6) Delete records from table
 - 7) Delete table and also Database.
 7. Write a program to demonstrate Spring.
 8. Write a program to demonstrate Spring JDBC operation.
 9. Write a program to demonstrate Java Mail functionalities.
 10. Write to program to demonstrate JMS queue
- S.4 Environment and Energy Studies (ML-301)
S.5 Computer Networks(BTIT-502)

UNIT I Computer Network:

Definitions, Goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, TCP/IP model overview, Descriptions of various layers and its comparison with TCP/IP. Network standardization.

UNIT II Data Link Layer:

Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB.

UNIT III MAC Sublayer:

Overview of MAC Layer, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11 wireless Communication.

UNIT IV Network Layer:

Need, Services Provided, Design issues, Routing and congestion in network layer, wired & wireless routing protocol examples, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multi cast Routing. IP protocol, IP Addresses, subnetting, Comparative study of IPv4 & IPv6, Mobile IP.

UNIT V Transport Layer:

Overview, Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Session layer: Overview, Authentication, Session layer protocol. Presentation layer: Overview, Data conversion, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler).Application Layer: Overview, WWW and HTTP, FTP, SSH.

Text Books:

1. Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.
2. Behrouz A. Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
3. William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
4. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
5. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

Reference Books:

1. Kaveh Pahlavan, Prashant Krishnamurthy, Networking Fundamentals, Wiley Publication, 2009.
2. Michael A. Gallo & William M. Hancock, Computer Communications & Networking Technologies, Cengagepearson publications, 2001.
3. Dimitri Bertsekas, Robert Gallager, Data Networks, PHI Publication, Second Edition, 1992.
4. Ulysses Black, Computer Networks, PHI Publication, Second Edition, 1993.

List of Practical:

1. Demonstrate Different Types of Network Equipment's.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.
4. Experiment with basic network command and Network configuration commands.
5. Examine network IP.
6. Write a program to implement various types of error correcting techniques.
7. Write a program to implement various types of farming methods.
8. Implement & simulate various types of routing algorithm.

9. Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.

10. Simulate STOP AND WAIT Protocols on NS-2.

11. Simulate various Routing Protocol on NS-2.

12. Simulate various Network Topologies on NS-2.

13. Configuring routers, bridges and switches and gateway on NS-2.

S.6 Operating Systems (BTCS-502)

UNIT I Introduction to Operating System:

Introduction and Need of operating system, Layered Architecture/Logical Structure of Operating system, Type of OS(Multiprogramming , Time Sharing, Real Time ,Networked, Distributed, Clustered, Hand Held), Operating system as Resource Manager and Virtual Machine, OS Services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader. Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

UNIT II Process Management:

Process Model, Creation, Termination, States & Transitions, Hierarchy, Context Switching, Process Implementation, Process Control Block, Basic System calls- Linux & Windows. Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling

UNIT III Interprocess Communication:

Introduction to Message Passing, Race Condition, Critical Section Problem, Peterson's Solution, Semaphore, Classical Problems of Synchronization Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem, Sleeping Barber Problem etc. Deadlock- System model, Resource types, Deadlock Problem, Deadlock Characterization, Methods for Deadlock Handling, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock Detection, Recovery from Deadlock.

UNIT IV Memory Management:

concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit and quick fit. Free space management- bitmap, link list/free list. Virtual Memory- concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging ,working set model, page fault frequency, thrashing, page replacement algorithms- optimal, FIFO, LRU; Bready's anomaly; TLB (translation look aside buffer).

UNIT V File Management:

Concepts, Naming, Attributes, Operations, Types, Structure, File Organization & Access (Sequential, Direct ,Index Sequential) Methods, Memory Mapped Files, Directory Structures One Level, Two Level, Hierarchical/Tree, Acyclic Graph, General Graph, File System Mounting, File Sharing, Path Name, Directory Operations, Overview Of File System in Linux &

Windows. Input/output Subsystems- Concepts, Functions/Goals, Input/Output devices- Block And Character, Spooling, Disk Structure & Operation, Disk Attachment, Disk Storage Capacity, Disk Scheduling Algorithm- FCFS, SSTF, Scan Scheduling, C-Scan Schedule.

Text books:

1. Abraham Silberschatz,"Operating system concepts",10th Edition,John Willey & Sons. INC, 2018
2. Andrew S.Tannanbaum, "Modern operating system", 4th Edition,Pearson Education, 2014
3. Dhananjay M. Dhamdhere, "Operating Systems:A concept Based Approach", 3rd Edition TMH, 2017,
4. SibsankarHaldar, Alex AlagarsamyAravind,"Operating System", 8 th Edition, Pearson Education India,, 2010

Reference Books:

1. Achyut S Godbole,"Operating System",3rd TMH,2017.
2. William Stalling, "operating system" 8th, Pearson Education, ,2014.
3. Vijay Shukla, "Operating System", 3rd, Kataria&Sons ,2013.
4. Singhal&Shivratri,"Advanced Concept in Operating Systems", 1st , TataMc-Graw Hill Education, edition 2017.

List of Practical:

1. Implement and update the BIOS settings of your PC.
2. If there are 5 printers are connected in a system each process to print will take different time to complete, and CPU will give a fixed time to each process after that deadline next process will enter in CPU. If a problem not completed in a given slot then that process will be reenter as per the FCFS, on rotation basis? Apply the scheduling on this?
3. Implement Non Preemptive Priority CPU Scheduling.
4. Implement Non Preemptive Shortest Job first CPU Scheduling.
5. If there are 5 different resources like 3 printer,2 scanner are connected to a system each taking different time to complete the task. Which scheduling is best and gives best performance of CPU?
6. Implement the scheduling for that where CPU give chance to complete those process first which comes first?
7. Implement Round-Robin CPU scheduling.
8. Write a program to implement Semaphore.
9. Find the solution for the situation where 5 faculties are sitting in a round table. There are 4 ball pens are placed on this table. At a time only one pen can be picked by one faculty to writing work. What will happen if all picked the pen for writing simultaneously?
10. Find the solution for dentist checkup clinic where only one chair and one dentist is available for treatment. And having n chairs to waiting for patient.
 - If there is no patient, then the doctor sleeps in his own chair.
 - When a patient arrives, he has to wake up the doctor.
 - If there are many patients and the doctor is doing treatment of him, then the remaining patients either wait if there are empty chairs in the waiting room or they leave if no chairs are empty.
11. Write a program for Memory Management Algorithms e.g. First Fit, Best Fit, Worst Fit.
12. Demonstrate Virtual memory Techniques like, LRU, FIFO etc.
13. Implement Shortest Seek Time First Disk Scheduling Algorithm.
14. Implement Scan Scheduling Disk Scheduling Algorithm.

15. Implement Circular Scan Disk Scheduling Algorithm.

16. Implement Look Disk Scheduling Algorithm.

S.7 Database Management Systems (BTCS-405)

UNIT I

Introduction:

Concept & Overview of DBMS, Purpose of Database Systems, Architecture of DBMS, Data Models and its type, Schema and Instances, Data Independence, DBA and its function.

Entity-Relationship Model:

Entities, Attributes and its types, Mapping Cardinalities, Keys, Entity Relationship Diagram, Weak entity set and Strong entity set and Extended E-R features (Generalization , Specialization, Aggregation) ,ER Diagram to Relational Table conversion.

UNIT-II

Relational Model:

Structure of Relational Databases, Relation , Characteristics of Relations, Domains, Tuples , Relational schema and instance, Relational Algebra, Relational Algebra Operations (select, project, join and its type, union, intersection, set difference, Cartesian product, rename, division), Extended Relational Algebra Operations (Generalized Projection , Aggregate Functions , Outer Join),

Relational Calculus:

types of relational calculus, tuple and domain oriented relational calculus, and its operation.

UNIT-III

Integrity Constraints:

Null Values, Domain Constraints, Entity Integrity Constraints Referential Integrity Constraints, Key constraints, Triggers.

Relational Database Design:

Functional Dependency, Inference rule, Different Anomalies in designing a Database.

Normalization , Decomposition, Normal Forms (1NF, 2NF, 3NF, BoyceCodd Normal Form, Normalization using Multi-Valued Dependencies, 4NF, Join Dependency, 5NF), Canonical cover.

UNIT IV

Query Optimization:

Introduction, steps of optimization, various algorithms to implement select, project and join operations of relational algebra, optimization methods: heuristic based, cost estimation based.

Transaction Processing, Concurrency Control and Recovery Management:

Transaction Model properties, State Serializability, Lock base protocols, Two Phase Locking, Time Stamping Protocols for Concurrency Control, and Validation Based Protocol, Multiple Granularities, Granularity of Data Item. Multi version schemes, Recovery with Concurrent Transaction, Recovery technique based on Deferred Update and Immediate Update, Shadow Paging, Recovery in Multi Database System and Database Backup and Recovery from Catastrophic Failure.

UNIT V

Index structures:

Types of index (primary, secondary, clustering, partitioning, unique and non index), use and Purpose of index, searching via an index.

SQL: DDL, DML, DQL (column function and grouping, union, multiple queries, union all, sub-query using IN, NOT IN, HAVING, GROUP BY CLAUSE), DCL (grant, revoke), TCL (Commit, roll back, save point, set Transaction)

Distributed database:

Planning for distributed database, management-centralized and decentralized Back-up and recovery.

Text books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.GrawHill, 6th Edition,2015.
2. C J Date, “An Introduction to Database System”, Pearson Educations, 8th Edition, 2004.
3. Elmasri, Navathe, “Fundamentals of Database Systems”, Pearson Educations 7th Edition, 2016.
4. SeemaKedar, Database Management System, Technical Publications, 2009. 5.
- 5.Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.

Reference Books:

1. IBM Career Education- database management system.
2. Abraham Silberschatz and S Sudarshan “Database System Concepts” 6th Edition McGraw-Hill Education – Europe 2013.
3. Raghu Ramakrishnan and Johannes Gehrke “Database Management Systems” McGrawHill Education, 2003.
4. Kahate, Atul “Introduction to Database Management Systems”Pearson Education India, 2006.

List of Practical:

1. Design a Database and create required tables. For e.g. Bank, College Database.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for table and record handling like implementing INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements and DROP, ALTER statements.
4. Write the queries for Retrieving Data from a Database Using the WHERE clause , Using Logical Operators in the WHERE clause , Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions and Combining Tables Using JOINS.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT () .
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Display name, hire date of all employees using cursors.
10. Display details of first 5 highly paid employees using cursors.
11. Write a database trigger which fires if you try to insert, update, or delete after 7'o' clock.
12. Write a data base trigger, which acts just like primary key and does not allow duplicate values.

13. Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.

14. Write the query for creating the users and their role. Using GRANT and REVOKE operations

6) B.tech (CSBS-TCS)

- Sem 1

S.1 Principles of Electrical Engineering (BTCSH-104)

UNIT I Introduction:

Concept of Potential difference, Voltage, Current, Fundamental Linear Passive and Active Elements to their Functional Current-Voltage Relation, Terminology and Symbols in Order to Describe Electric Networks, Voltage Source and Current Sources, Ideal and Practical Sources, Concept of Dependent and Independent Sources, Kirchhoff-S Laws and Applications to Network Solutions Using Mesh and Nodal Analysis, Concept of Work, Power, Energy, and Conversion of Energy.

UNIT II DC Circuits:

Current-Voltage Relations of the Electric Network by Mathematical Equations to Analyze the Network (Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem) Simplifications of Networks using Series-Parallel, Star/Delta Transformation. Superposition Theorem.

UNIT III AC Circuits:

AC Waveform Definitions, Form Factor, Peak Factor, Study of R-L, R-C, RLC Series Circuit, R-L-C Parallel Circuit, Phasor Representation in Polar and Rectangular form, Concept of Impedance, Admittance, Active, Reactive, Apparent and Complex Power, Power Factor, 3 Phase Balanced AC Circuits ($\lambda-\Delta$ & $\lambda-\lambda$).

UNIT IV Electrostatics and Electro-Mechanics:

Electrostatic Field, Electric Field Strength, Concept of Permittivity in Dielectrics, Capacitor Composite, Dielectric Capacitors, Capacitors in Series and Parallel, Energy Stored in Capacitors, Charging and Discharging of Capacitors, Electricity and Magnetism, Magnetic Field and Faraday's Law, Self and Mutual Inductance, Ampere's Law, Magnetic Circuit, Single Phase Transformer, Principle of Operation, EMF Equation, Voltage Ratio, Current Ratio, KVA Rating, Efficiency and Regulation, Electromechanical Energy Conversion.

UNIT V Measurements and Sensors:

Introduction To Measuring Devices/Sensors and Transducers (Piezoelectric and Thermo-Couple) Related to Electrical Signals, Elementary Methods for the Measurement of Electrical Quantities in DC and AC Systems (Current & Single-Phase Power). Electrical Wiring And Illumination System: Basic Layout Of The Distribution System, Types of Wiring System & Wiring Accessories, Necessity of Earthing, Types of Earthing, Safety Devices & System. For Further Reading - Principle of Batteries, Types, Construction and Application, Magnetic Material and B-H Curve, Basic Concept of Indicating and Integrating Instruments.

TEXT BOOKS:

1. Electric Machinery,(Sixth Edition) A.E. Fitzgerald, Kingsley Jr Charles, D. Umans Stephen, Tata McGraw Hill.
2. A Textbook of Electrical Technology,(vol. I),B. L. Theraja, Chand and Company Ltd., New Delhi.
3. Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
4. Theory and problems of Basic Electrical Engineering, (Second Edition), J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.

REFERENCES:

1. Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press.
2. T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, Oxford University Press, 2011.
3. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), Cambridge University Press.
4. Engineering Circuit Analysis, William H. Hayt & Jack E. Kemmerly, McGraw-Hill Book Company Inc.
5. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, Prentice Hall (India) Pvt. Ltd.

List of Practical's:

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits
2. Determination of resistance temperature coefficient
3. Verification of Network Theorem (Superposition, Thevenin, Norton, Maximum Power Transfer theorem)
4. Simulation of R-L-C series circuits for $XL > XC$, $XL < XC$
5. Simulation of Time response of RC circuit
6. Verification of relation in between voltage and current in three phase balanced star and delta
7. Demonstration of measurement of electrical quantities in DC and AC systems.

S.2 Physics for Computing Science (BTCSH-105)

UNIT I Oscillation:

Periodic Motion-Simple Harmonic Motion-Characteristics of Simple harmonic Motion-Vibration of Simple Spring Mass System. Resonance-Definition., Damped harmonic Oscillator – Heavy, Critical and Light Damping, Energy Decay in a Damped Harmonic oscillator, Quality Factor, Forced Mechanical and Electrical Oscillators.

UNIT II Interference-principle of superposition-young's experiment:

Theory of Interference Fringes-Types of Interference-Fresnel's Prism-Newton's Rings, Diffraction-Two kinds of Diffraction-Difference between Interference and Diffraction-Fresnel's Half Period Zone and Zone Plate-Fraunhofer Diffraction at Single Slit-Plane Diffraction Grating. Temporal and Spatial Coherence.

Polarization of light: Polarization - Concept of Production of Polarized Beam of Light from two SHM Acting at Right Angle; Plane, Elliptical and Circularly Polarized Light, Brewster's Law, Double Refraction.

UNIT III Basic Idea of Electromagnetisms:

Continuity Equation for Current Densities, Maxwell's Equation in Vacuum and Non-Conducting Medium. Quantum Mechanics: Introduction- Planck's Quantum Theory- Matter Waves, De-Broglie Wavelength, Heisenberg's Uncertainty Principle, Time Independent and Time Dependent Schrödinger's Wave Equation, Physical Significance of Wave Function, Particle in a One Dimensional Potential Box, Heisenberg Picture.

UNIT IV Crystallography:

Basic Terms-Types of Crystal Systems, Bravais lattices, Miller Indices, D Spacing, Atomic Packing Factor for SC, BCC, FCC and HCP Structures. Semiconductor Physics: Conductor, Semiconductor and Insulator; Basic concept of Band theory. Thermodynamics: Zeroth Law of Thermodynamics, First Law of Thermodynamics, Brief Discussion on Application of 1st Law, Second Law of Thermodynamics and Concept of Engine, Entropy, Change in Entropy in Reversible and Irreversible Processes.

UNIT V Laser and Fiber optics:

Einstein's Theory of Matter Radiation Interaction and A and B Coefficients; Amplification of light by Population Inversion, Different Types of Lasers: Ruby Laser, CO₂ and Neodymium Lasers; Properties of Laser Beams: Mono-Chromaticity, Coherence, Directionality and Brightness, Laser Speckles, Applications of Lasers in Engineering. Fiber Optics and Applications, Types of Optical Fibers.

TEXT BOOKS:

1. Concepts of Modern Physics, (Fifth Edition) A Beiser, McGraw Hill International.
2. Fundamentals of Physics, David Halliday, Robert Resnick and Jearl Walker, Wileyplus.

REFERENCES:

1. Optics, (Fifth Edition) Ajoy Ghatak, Tata McGraw Hill.
2. Sears & Zemansky University Physics, Addison-Wesley.
3. Fundamentals of Optics, (Third Edition) Jenkins and White, McGraw-Hill.

List of Practical's:

1. Magnetic field along the axis of current carrying coil – Stewart and Gee
2. Determination of Hall coefficient of semi-conductor
3. Determination of Plank constant
4. Determination of wave length of light by Laser diffraction method
5. Determination of wave length of light by Newton's Ring method
6. Determination of laser and optical fiber parameters
7. Determination of Stefan's Constant.

S.3 Business Communication and Value Science – I (BTCSH-106)

	Leadership Oriented Learning (LOL)	
Nature of Course	Behavioral	
Pre requisites	Basic Knowledge of high school English	
Course Objectives:		
1	Understand what life skills are and their importance in leading a happy and well-adjusted life	
2	Motivate students to look within and create a better version of self	
3	Introduce them to key concepts of values, life skills and business communication	
Course Outcomes:		
Upon completion of the course, students shall have ability to		
C1.6.1	Recognize the need for life skills and values	[U]
C1.6.2	Recognize own strengths and opportunities	[U]
C1.6.3	Apply the life skills to different situations	[AP]
C1.6.4	Understand the basic tenets of communication	[U]
C1.6.5	Apply the basic communication practices in different types of communication	[AP]
Course Contents:		
<input type="checkbox"/> Overview of the course with immersion activity <input type="checkbox"/> Overview of biz communication <input type="checkbox"/> Self-awareness, confidence and communication		

<input type="checkbox"/> Essentials of Business communication			
<input type="checkbox"/> Application of communication skills			
<input type="checkbox"/> Application of Life Skills			
<input type="checkbox"/> Assignment			
Total Hours:	65		
Text Books:			
	There are no prescribed texts for Semester 1 – there will be handouts and reference links shared.		
Reference Books:			
1	English vocabulary in use – Alan Mc'carthy and O'dell		
2	APAART: Speak Well 1 (English language and communication)		
3	APAART: Speak Well 2 (Soft Skills)		
4	Business Communication – Dr. Saroj Hiremath		
Web References:			
1	Train your mind to perform under pressure- Simon sinek https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/		
2	Brilliant way one CEO rallied his team in the middle of layoffs https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html		
3	Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0		
Online Resources:			
1	https://www.coursera.org/learn/learning-how-to-learn		
2	https://www.coursera.org/specializations/effective-business-communication		
Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative assessment (Max. Marks:20)			
Course Outcome	Bloom's Level	Assessment Component	Marks
C1.6.1	Understand	Immersion (interview)	5
C1.6.3	Apply	Group Assignment – community service	5
C1.6.4	Understand	Group activities	3
C1.6.5	Apply	Record a conversation	3
Summative Assessment based on End Semester Project			
Bloom's Level			
Understand	Paper Trek followed by project		50
Apply			
Analyse			

Lesson Plan

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
1	Recognize the need for life skills and values	Understand	Overview of LOL (include activity on introducing self)	Lecture & reflection	1 hour
			Class activity – presentation on favorite cricket captain in IPL and the skills and values they demonstrate	Activity	1 hour
			Self-work with immersion – interview a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them	Immersion activity	2 hours
			Overview of business communication	Lecture with videos	1 hour
			Activity: Write a newspaper report on an IPL match	Class activity with 3 iterations - Formative Evaluation	1 hour
			Activity: Record a conversation between a celebrity and an interviewer	Class activity with 3 iterations - Formative Evaluation	1 hour
			Quiz Time	Summative Evaluation for Unit	30 mins

Lesson Plan

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
1	Recognize the need for life skills and values	Understand	Overview of LOL (include activity on introducing self)	Lecture & reflection	1 hour
			Class activity – presentation on favorite cricket captain in IPL and the skills and values they demonstrate	Activity	1 hour
			Self-work with immersion – interview a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them	Immersion activity	2 hours
			Overview of business communication	Lecture with videos	1 hour
			Activity: Write a newspaper report on an IPL match	Class activity with 3 iterations - Formative Evaluation	1 hour
			Activity: Record a conversation between a celebrity and an interviewer	Class activity with 3 iterations - Formative Evaluation	1 hour
			Quiz Time	Summative Evaluation for Unit	30 mins

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
		Understand	Self-awareness – identity, body awareness, stress management	Anubhaab Activities (Please conduct at least one activity per week and include the Meditation session in it)	4 hours
2	Understand the basic tenets of communication Unit name: Be At Ease (BAE) (in Millennial lingo it means Before Anyone Else)	Understand	Essential Grammar – I: Refresher on <u>Parts of Speech</u> – Listen to an audio clip and note down the different parts of speech followed by discussion Tenses: Applications of tenses in Functional Grammar – Take a quiz and then discuss	Lecture with audio and video	1 hour
			Sentence formation (general & Technical), Common errors, Voices. Show sequence from film where a character uses wrong sentence structure (e.g. Zindagi Na MilegiDobara where the characters use 'the' before every word)	Lecture with video/audio	1 hour
			Communication Skills: Overview of Communication Skills Barriers of communication, Effective communication		1 hour
			Types of communication- verbal and non – verbal – Role-play based learning Importance of Questioning	Activity based learning	1 hour
			Listening Skills: Law of nature- Importance of listening skills, Difference between listening and hearing, Types of listening.	Activity based learning	1 hour
	Recognize own strengths and	Understand	Expressing self , connecting with emotions, visualizing and	Anubhaab Activities	4 hours

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
	opportunities		experiencing purpose	(Please conduct at least one activity per week and include the Meditation session in it)	
	Apply the basic communication practices in different types of communication	Apply	Activity: Skit based on communication skills Evaluation on Listening skills – listen to recording and answer questions based on them	Formative Evaluation Formative Evaluation	4 hours 30 mins
3	Understand the basic tenets of communication Talk Mail Write (TMW) - In Millennial it means That Moment When	Understand	Email writing: Formal and informal emails, activity Verbal communication: Pronunciation, clarity of speech Vocabulary Enrichment: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary – Read Economic Times, Reader’s Digest, National Geographic and take part in a GD, using the words you learnt/liked from the articles. Group discussion using words learnt Practice: Toastmaster style Table Topics speech with evaluation Written Communication: Summary writing, story writing Build your CV – start writing your comprehensive CV including every achievement	Activity based learning Audio and video based learning Activity based learning (Group Discussion) Flipped classroom where students will study words before coming to class	1 hour 30 minutes 1 hour

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			in your life, no format, no page limit		
	Apply the basic communication practices in different types of communication	Apply	Project: Create a podcast on a topic that will interest college students	Formative Evaluation	1 hour
	Recognize own strengths and opportunities	Understand	Life skill: Stress management, working with rhythm and balance, colours, and teamwork	Anubhaab Activities (Please conduct at least one activity per week and include the Meditation session in it)	4 hours
	Apply the basic communication practices in different types of communication	Apply	Project: Create a musical using the learnings from unit	Formative Evaluation	2 hours
4	Unit 4 Recognize the need for life skills and values Unit name: Realities of Facing Life (ROFL)	Understand	Understanding Life Skills: Movie based learning – Pursuit of Happyness. What are the skills and values you can identify, what can you relate to?	Interactive learning	3 hours
			Introduction to life skills What are the critical life skills	Activity and Video	1 hour
			Multiple Intelligences Embracing diversity – Activity on appreciation of diversity	Video and activity based	1 hour
	Apply the life skills to different situations	Apply	Life skill: Community service – work with an NGO and make a presentation	Field work: Formative Evaluation	10 hours
			Life skill: Join a trek – Values to be learned: Leadership, teamwork, dealing with ambiguity, managing stress,	Field work: Formative Evaluation	12 hours

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			motivating people, creativity, result orientation		
				TOTAL	65 hours
Summative Evaluation	Bloom's Level	Type of Assessment	Marks	Total	50 marks
	Understand	Knowledge Test	20 marks		
	Apply	Project (to be evaluated by TCS)	20 marks		
	Apply	Group discussion (to be evaluated by TCS)	10 marks		

S.4 Discrete Mathematics (BTCSH-101)

UNIT I Boolean algebra:

Introduction Of Boolean Algebra, Truth Table, Basic Logic Gate, Basic Postulates Of Boolean Algebra, Principle Of Duality, Canonical Form, Karnaugh Map. UNIT II Abstract algebra: Set, Relation, Group, Ring, Field. UNIT III Combinatorics: Basic Counting, Balls And Bins Problems, Generating Functions, Recurrence Relations. Proof Techniques, Principle of Mathematical Induction, Pigeonhole Principle.

UNIT IV Graph Theory:

Graphs and Digraphs, Complement, Isomorphism, Connectedness and Reachability, Adjacency Matrix, Eulerian Paths And Circuits in Graphs and Digraphs, Hamiltonian Paths and Circuits in Graphs and Tournaments, Trees; Planar Graphs, Euler's Formula, Dual of A Planer Graph, Independence Number And Clique Number, Chromatic Number, Statement of FourColor Theorem.

UNIT V Logic:

Propositional Calculus - Propositions and Connectives, Syntax; Semantics - Truth assignments and Truth Tables, Validity and Satisfiability, Tautology; Adequate Set of Connectives; Equivalence and Normal Forms; Compactness and Resolution; Formal Reducibility - Natural Deduction System and Axiom System; Soundness and Completeness.

TEXT BOOKS:

1. Topics in Algebra, I. N. Herstein, John Wiley and Sons.
2. Digital Logic & Computer Design, M. Morris Mano, Pearson.
3. Elements of Discrete Mathematics, (Second Edition) C. L. LiuMcGraw Hill, New Delhi.
4. Graph Theory with Applications, J. A. Bondy and U. S. R. Murty, Macmillan Press, London.
5. Mathematical Logic for Computer Science, L. Zhongwan, World Scientific, Singapore.

REFERENCES:

1. Introduction to linear algebra. Gilbert Strang.
2. Introductory Combinatorics, R. A. Brualdi, North-Holland, New York.
3. Graph Theory with Applications to Engineering and Computer Science, N. Deo, Prentice Hall, Englewood Cliffs.

4. Introduction to Mathematical Logic,(Second Edition), E. Mendelsohn, Van-Nostrand, London.

S.5 Statistics, Probability and Calculus (BTCSH-102)

UNIT I Introduction to Statistics:

Definition of Statistics. Basic objectives. Applications in Various Branches of Science with Examples. Collection of Data: Internal and External Data, Primary and Secondary Data. Population and Sample, Representative Sample.

UNIT II Descriptive Statistics:

Classification and Tabulation of Univariate Data, Graphical Representation, Frequency Curves. Descriptive Measures - Central Tendency and Dispersion. Bivariate Data. Summarization, Marginal and Conditional Frequency Distribution.

UNIT III Probability:

Concept Of Experiments, Sample Space, Event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem. Probability Distributions: Discrete & Continuous Distributions, Binomial, Poisson and Geometric Distributions, Uniform, Exponential, Normal, Chi-Square, T, F Distributions.

UNIT IV Expected Values and Moments:

Mathematical Expectation and its Properties, Moments (Including Variance) and their Properties, Interpretation, Moment Generating Function.

UNIT V Calculus:

Basic Concepts of Differential and Integral Calculus, Application of Double and Triple Integral.

TEXT BOOKS:

- 1. Introduction of Probability Models, S.M. Ross, Academic Press, N.Y.**
- 2. Fundamentals of Statistics, vol. I & II, A. Goon, M. Gupta and B. Dasgupta, World Press.**
- 3. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, Delhi.**

REFERENCES:

- 1. 1 A first course in Probability, S.M. Ross,Prentice Hall.**
- 2. Probability and Statistics for Engineers,(Fourth Edition), I.R. Miller, J.E. Freund and R. Johnson, PHI.**
- 3. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybilland D.C. Boes,McGraw Hill Education.**
- 4. Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Thomson Learning.**
- 5. Advanced Engineering Mathematics, (Second Edition) M. D. Greenberg, Pearson Education.**
- 6. Applied Mathematics, Vol. I & II, P. N. Wartikar andJ. N. Wartikar,VidyarthiPrakashan.**

S.6 Fundamentals of Computer Science (BTCSCS-103)

UNIT I General problem Solving concepts:

Algorithm, and Flowchart for Problem Solving with Sequential Logic Structure, Decisions and Loops.

Imperative languages:

Introduction to imperative language; syntax and constructs of a specific language (ANSI C) .

Types Operator and Expressions with discussion of variable naming and Hungarian Notation:

Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, Proper Variable Naming and Hungarian Notation

UNIT II Control Flow with discussion on structured and unstructured programming:

Statements and Blocks, If-Else-If, Switch, Loops – While, do, For, Break and Continue, Goto Labels, structured and un- structured programming

UNIT III Functions and Program Structure with discussion on standard library:

Basics of Functions, Parameter Passing and Returning Type, C main Return as Integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block Structure, Initialization, Recursion, Preprocessor, Standard Library Functions and Return Types

UNIT IV Pointers and Arrays:

Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, Complicated declarations and how they are evaluated. Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields

UNIT V Input and Output:

Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, File access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, Related miscellaneous functions Unix system Interface: File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator Programming Method: Debugging, Macro, User Defined Header, User Defined Library Function, Makefile Utility.

TEXT BOOKS:

1. **The C Programming Language, (Second Edition) B. W. Kernighan and D. M. Ritchi, PHI.**
2. **Programming in C, (Second Edition)B. Gottfried, Schaum Outline Series.**

REFERENCES:

1. **C: The Complete Reference,(Fourth Edition), Herbert Schildt, McGraw Hill.**
2. **Let Us C,YashavantKanetkar, BPB Publications.**

List of Practical's:

- 1. Algorithm and flowcharts of small problems like GCD**
- 2. Structured code writing with:**
 - i. Small but tricky codes**
 - ii. Proper parameter passing**
 - iii. Command line Arguments **
 - iv. Variable parameter**
 - v. Pointer to functions**
 - vi. User defined header**
 - vii. Make file utility**
 - viii. Multi file program and user defined libraries**
 - ix. Interesting substring matching / searching programs**
 - x. Parsing related assignments**
 - i. Interesting substring matching / searching programs**
 - ii. Parsing related assignments**

- Sem 2

S.1 Data Structures and Algorithms (BTCSCS-109)

UNIT I Basic Terminologies and Introduction to Algorithm & Data Organisation:

Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction

UNIT II Linear Data Structure:

Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures

UNIT III Non-linear Data Structure:

Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations & Applications of Non-Linear Data Structures

UNIT IV Searching and Sorting on Various Data Structures:

Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heapsort, Introduction to Hashing

UNIT V File:

Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes. Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

TEXT BOOKS:

1. **Fundamentals of Data Structures**, E. Horowitz and S. Sahni, 1977.
2. **Data Structures and Algorithms**, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman.

REFERENCES:

1. **The Art of Computer Programming: Volume 1: Fundamental Algorithms**, Donald E. Knuth
2. **Introduction to Algorithms**, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
3. **Open Data Structures: An Introduction (Open Paths to Enriched Learning)**, 31st ed. Edition , Pat Morin

List of Practical:

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.
3. Line editors with line count, word count showing on the screen.
4. Trees with all operations.
5. All graph algorithms.
6. Saving / retrieving non-linear data structure in/from a file

S.2 Principles of Electronics Engineering (BTCSH-110)

UNIT I Semiconductors:

Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers.

Diodes and Diode Circuits:

Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance. Linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

UNIT II Bipolar Junction Transistors:

Formation of PNP / NPN junctions; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor

UNIT III Field Effect Transistors:

Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles

UNIT IV Feed Back Amplifier, and Operational Amplifiers:

Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability. Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and noninverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator

UNIT V Digital Electronics Fundamentals:

Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K-map, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters.

TEXT BOOKS:

1. **Microelectronics Circuits, Adel S. Sedra and Kenneth Carless Smith**
2. **Millman's Integrated Electronics, Jacob Millman, Christos Halkias, Chetan Parikh.**
3. **Digital Logic & Computer Design, M. Morris Mano**

REFERENCES :

1. **Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky.**
2. **Solid State Electronic Devices, 6th Edition, Ben Streetman, Sanjay Banerjee**
3. **Electronic Principle, Albert Paul Malvino.**
4. **Electronics Circuits: Discrete & Integrated, D Schilling, C Belowe, T Apelewicz, R Saccardi.**
5. **Microelectronics, Jacob Millman, Arvin Grabel.**
6. **Electronics Devices & Circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj**
7. **Electronic Devices & Circuit Theory, 11th Edition, Robert L. Boylestad, Louis Nashelsky**

List of Practical:

1. **Semiconductor Diodes and application,**
2. **Transistor circuits,**
3. **JFET, oscillators and amplifiers.**

S.3 Fundamentals of Economics (BTCSH-111)

UNIT-I Microeconomics:

Principles of Demand and Supply — Supply Curves of Firms — Elasticity of Supply; Demand Curves of Households — Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve);

UNIT-II Welfare Analysis —

Consumers' and Producers' Surplus — Price Ceilings and Price Floors; Consumer Behaviour — Axioms of Choice — Budget Constraints and Indifference Curves; Consumer's Equilibrium — Effects of a Price Change, Income and Substitution Effects —Derivation of a Demand Curve;

UNIT-III Applications —

Tax and Subsidies — Intertemporal Consumption — Suppliers' Income Effect; Theory of Production — Production Function and Iso-quants — Cost Minimization; Cost Curves — Total, Average and Marginal Costs — Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition

UNIT-IV Macroeconomics:

National Income and its Components — GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector — Taxes and Subsidies; External Sector — Exports and Imports; Money — Definitions; Demand for Money — Transactionary and Speculative Demand; Supply of Money — Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets — IS.

UNIT-V LM Model;

Business Cycles and Stabilization — Monetary and Fiscal Policy — Central Bank and the Government; The Classical Paradigm — Price and Wage Rigidities — Voluntary and Involuntary Unemployment

TEXT BOOKS:

1. Microeconomics, Pindyck, Robert S., and Daniel L. Rubinfeld.
2. Macroeconomics, Dornbusch, Fischer and Startz.
3. Economics, Paul Anthony Samuelson, William D. Nordhaus.

REFERENCES:

1. Intermediate Microeconomics: A Modern Approach, Hal R. Varian.
2. Principles of Macroeconomics, N. Gregory Mankiw

S.4 Business Communication and Value Science – II (BTCSH-112)

	Leadership Oriented Learning (LOL)	
Nature of Course	Behavioral	
Pre requisites	Basic Knowledge of English (verbal and written) Completion of all units from Semester 1	
Course Objectives:		
1	Develop effective writing, reading, presentation and group discussion skills.	
2	Help students identify personality traits and evolve as a better team player.	
3	Introduce them to key concepts of a) Morality b) Behavior and beliefs c) Diversity& Inclusion	
Course Outcomes:		
Upon completion of the course, students shall have ability to:		
C2.6.1	Understand tools of structured written communication	[U]
C2.6.2	Use tools of structured written communication	[AP]
C2.6.3	Use electronic/social media to share concepts and ideas	[AP]
C2.6.4	Develop materials to create an identity for an organization dedicated to a social cause	[C]
C2.6.5	Understand the basics of presentation	[U]
C2.6.6	Apply effective techniques to make presentations.	[AP]
C2.6.7	Assess presentations based on given criteria	[E]
C2.6.8	Understand tools for quick reading.	[U]
C2.6.9	Apply the basic concept of speed reading, skimming and scanning.	[AP]
C2.6.10	Identify individual personality types and role in a team.	[U]
C2.6.11	Recognize the concepts of outward behavior and internal behavior	[AP]
C2.6.12	Understand the basic concepts of Morality and Diversity	[U]
C2.6.13	Create communication material to share concepts and ideas	[C]
C2.6.14	Argue on a topic based on morality and diversity	[E]
C2.6.15	Articulate opinions on a topic with the objective of influencing others	[C]
C2.6.16	Organize an event to generate awareness and get support for a cause	[C]

Course Contents:

- Identification of common errors in written communication and ways of rectification
- Understanding speed reading techniques – Skimming and Scanning
- Application of reading and writing skills
- Analyzing personality traits and team player style
- Understanding the concepts of Morality, Diversity and Inclusion
- Application of these concepts
- Creation of communication material
- Experiencing diversity and organizing events to support inclusion
- Assignment – Assimilation of concepts and present them effectively

Total Hours:	61
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Text Books:

	There are no prescribed texts for Semester 2 – there will be handouts and reference links shared.
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Reference Books:

1	Guiding Souls : Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam ;Publishing Year-2005; Co-author--Arun Tiwari
2	The Family and the Nation; Dr. A.P.J Abdul Kalam; Publishing year: 2015; Co-author: Acharya Mahapragya
3	The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.J Abdul Kalam; Publishing year: 2011; Co-author- Y.S.Rajan
4	Forge Your Future: Candid, Forthright, Inspiring ; Dr. A.P.J Abdul Kalam; Publishing year: 2014
5	Abundance: The Future is Better Than You Think; Peter H. Diamandis and Steven Kotler; Published: 21 Feb, 2012; Publisher: Free Press
6	Start With Why: How Great Leaders Inspire Everyone to Take Action; Simon Sinek; Published: 6 October 2011; Publisher: Penguin
7	Advertising & IMC: Principles and Practice; Sandra Moriarty, Nancy D. Mitchell, William D. Wells; Published: 15 June 2016; Publisher: Pearson

	Education India									
Web References:										
1	ETHICS FUNDAMENTALS AND APPROACHES TO ETHICS https://www.eolss.net/Sample-Chapters/C14/E1-37-01-00.pdf									
2	A Framework for Making Ethical Decisions https://www.brown.edu/academics/science-and-technology-studies/framework-making-ethical-decisions									
3	Five Basic Approaches to Ethical Decision-Making http://faculty.winthrop.edu/meelerd/docs/rolos/5_Ethical_Approaches.pdf									
Online Resources:										
1	https://youtu.be/CsaTslhSDI									
2	https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M									
3	https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y									
4	https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be									
5	https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be									
Assessment Methods & Levels (based on Bloom's Taxonomy)										
Formative assessment (Max. Marks:20)										
Course Outcome	Bloom's Level	Assessment Component			Marks					
C1.6.1	Understand	Immersion (interview)			5					
C1.6.2	Understand	Create CV			4					
C1.6.3	Apply	Group Assignment- Form an NGO			5					
C1.6.4	Understand	Group activities			3					
C1.6.5	Create	Create and present a street play to articulate and amplify the social cause.			3					
Summative Assessment based on End Semester Project										
Bloom's Level										
Understand	Written Assessment, project and group discussion									
Apply										
Analyze										
Lesson Plan										
Unit No	Objective	Bloom's Level	Content	Type of Class	Duration					
			Icebreaker. 1) Participate in 'Join							

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
1			<p>Hands Movement'. Individual identification of social issues.2) Each Individual chooses one particular social issue which they would like to address. 3) Class to be divided in teams for the entire semester. All activities to be done in teams and the grades, credit points will be captured in the leader board in the class room.4) Theory to introduce the participant Slam book to be used for capturing individual learning points and observations.</p>	Group discussion, Practical	60 Minutes
1	Understand tools of structured written communication	Understand	Research on the social cause each group will work for.	Practical (practical)	90 Minutes
1	Use tools of structured written communication	Understand	Class discussion-Good and Bad Writing. Common errors, punctuation rules, use of words.	PPT, Theory and Practical	90 Minutes
1			Group Practical – As a group, they will work on the social issue identified by them. Research, read and generate a report based on the findings.(Apply the	Formative evaluation	70 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			learning and recap from the session)		
1	Create communication material to share concepts and ideas	Create	Practical: Plan and design an E Magazine. Apply and assimilate the knowledge gathered from Sem-1 till date. Share objective & guideline. All members to contribute an article to the magazine, trainer to evaluate the content.	Practical (Practical)	120 Minutes
1	Understand tools for Lucid writing	Understand	Lucid Writing: Encourage the students to go through the links given about Catherine Morris and Joanie Mcmahon's writing techniques.	Theory and Discussion	30 mins
1	Create communication material to share concepts and ideas	Create	Create the magazine	Practical (Lab)	90 Minutes
1		Understand	SATORI – Participants share the personal take away acquired from GD, writing and reading skills activities captured in their handbook. Share the most important learning points from the activities done so far and how that learning has brought a change.	Theory/Discussion	60 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
1	Use electronic/social media to share concepts and ideas	Apply	Launching an E Magazine.	Practical (Lab)	120 Minutes
1			Quiz Time	Summative Evaluation for Unit	60 Minutes
Unit 2					
2	Develop materials to create an identity for an organization dedicated to a social cause	Create	Each group will form an NGO. Create Vision, Mission, Value statement, tagline and Design a logo.	Practical and Practical	90 Minutes
2	Understand the basics of presentation	Understand	Introduction to basic presentation skills& ORAI app	Theory and video	60 Minutes
2	Apply effective techniques to make presentations.	Apply	Groups to present their NGOs. Apply the learning gathered from session 2. Presentation to be recorded by the groups. feedback from the audience/ Professor	Formative evaluation	60 Minutes
2	Assess presentation based on given criteria	Evaluate	Group to come back and share their findings from the recording. Post work- individual	Sharing of learning, written Practical and formative	60 Minutes & 60 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			write up to be written and evaluated for the E-magazine	evaluation	
2	Create communication material to share concepts and ideas Use electronic/social media to share concepts and ideas	Create Apply	Prepare and publish the Second episode of the E Magazine.	Practical (Lab)	120 minutes
2	Understand the tools for speed reading. Apply the basic concepts of speed reading, skimming and scanning.	Understand Apply	Speed Reading session: Introduction to skimming and scanning; practice the same.	Theory and Practical	30 Minutes
2		Understand	SATORI – Join the dots- Participants to connect their learning gathered from AIP Unit-2 with their existing curriculum	Share the most important learning points	60 Minutes
2			Quiz Time	Summative Evaluation for Unit	60 Minutes
Unit 3					
3	Develop materials to create an identity for an organization dedicated to a social cause		Ad campaign- Brain storming session- Students to discuss and explore the means of articulating	Discussion	60 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
		Create	and amplifying the social issue their NGOs are working for.		
3	Create communication material to share concepts and ideas.	Create	Design a skit- a) write the script articulating the message of their respective NGOs. Read out the script. (Skit time-5 minutes). Feedback of Theory.	Practical based learning. Formative evaluation by Theory	a) 30 Minutes b) 60 Minutes
3	Use electronic/social media to share concepts and ideas	Apply Apply	Promote the play through a social media and gather your audience. Enact the play. Capture the numbers of likes and reviews. Theory to assign grades to individual team.	Practical based learning Formative Evaluation	Lab Time: 90 Minutes Class Time:60Minutes
3	Identify individual personality types and role in a team.	Understand	(1) Theory to find out from the participants their views, observations and experiences of working in a team(2) Intro of Dr. Meredith Belbin and his research on team work and how individuals contribute.	Discussion and Theory	60 Minutes
3	Identify individual personality types and role in a team.	Understand	Cont. (3) Belbin's 8 Team Roles and Lindgren's Big 5 personality traits.(4) Belbin's 8 team	Practical based learning followed by a presentation	40 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			player styles		
3	Identify individual personality types and role in a team.	Understand	(1) Team Falcon Practical to identify individual personality traits with Belbin's 8 team player styles	Practical based learning followed by a presentation.	(1 &2) 40 Minutes
3	Recognize the concepts of outward behavior and internal behavior	Understand	(2) Similar personality types to form groups (3) Groups present their traits.	Presentation	(3) 60 minutes
3	Create communication material to share concepts and ideas. Use the electronic/social media to share concepts and ideas	Create Apply	Prepare and publish the third episode of the E Magazine.	Practical	60 Minutes
3		Understand Understand	SATORI – (join the dots with participants personal life) Participants share the personal take away acquired from working in teams, GD, learning about presentations, presenting their NGOs	Share the most important learning points from the activities done so far. Participants talk about the changes they perceive in themselves	60 Minutes
3			Quiz Time	Summative Evaluation for	60 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
				Unit	
Unit 4					
4	Understand the basic concepts of Morality and Diversity	Understand	Ten minutes of your time – a short film on diversity. Play the video (link to be attached in the FG)	Video discussion &	30Minutes
4	Understand the basic concepts of Morality and Diversity	Understand	Discuss key take away of the film. Theory to connect the key take away of the film to the concept of empathy.	Practical	30 Minutes
4	Understand the basic concepts of Morality and Diversity	Understand	Touch the target (Blind man) - Debriefing of the Practical. Film: "The fish and I" by Babak Habibifar" (1.37mins)	Practical and discussion	60 Minutes
4	Create communication material to share concepts.	Create	Groups to create a story – 10 minutes of a person's life affected by the social issue groups are working on. Narrate the story in first person. Feedbacks to be shared by the other groups.	Practical, sharing and Practical	120 Minutes
4	Understand the basic concepts of Morality and Diversity	Understand	Research on a book, incident or film based on the topic of your respective NGO	Research and written Practical	120 Minutes
4	Create communication material to share	Create	Write a review in a blog on the topics they are covering in	Written Practical	60 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
	concepts.		their research. Theory will give grades to each team.	and Formative Evaluation	
4	Understand the basic concepts of Morality and Diversity	Understand	Session on Diversity & Inclusion- Different forms of Diversity in our society.	PPT, Theory, discussion	60 Minutes
4	Create communication material to share concepts.	Create	Teams to video record interviews of people from diverse groups (Ask 5 questions). Share the recordings in FB	Practical	120 Minutes
4	Argue on a topic based on morality and diversity	Evaluate	Debate on the topic of diversity with an angle of ethics, morality and respect for individual (In the presence of an external moderator). Groups will be graded by the professor.	Practical and formative evaluation	60 Minutes
4	Articulate opinions on a topic with the objective of influencing others	Create	Prepared speech- Every student will narrate the challenges faced by a member of a diverse group in 4 minutes (speech in first person). Theory to give feedback to each student.	Practical and formative Evaluation	90 Minutes
4	Understand the basic concepts of Morality and Diversity	Understand	Discussion on TCS values, Respect for Individual and Integrity.	PPT, Practical and discussion Theory,	60 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
4	Create communication material to share concepts and ideas. Use the electronic/social media to share concepts and ideas	Create Apply	Prepare and publish the final episode of the E Magazine.	Practical	120 Minutes
4		Understand	SATORI – Participants share the personal take away acquired from working in teams, GD, learning about presentations and understanding diversity inclusion.	Discussion	60 Minutes
4	Use tools of structured written communication	Apply	Revisit your resume Include your recent achievements in your resume.	Submit it to the Professor	Lab time-30 Minutes
4			Quiz Time	Summative Evaluation for Unit	60 Minutes
4	Organize an event to generate awareness and get support for a cause	Create	Project-1) Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting. 2) Spend a day with the NGO/ social group to understand exactly how they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/	Field work: Formative Evaluation	7 Hours

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			<p>social group to address their university students for couple of hours. Plan the entire event, decide a suitable venue in the university, gather audience, invite faculty members etc. (they need to get their plan ratified by their professor). Outcome-- Host an interactive session with the NGO spokesperson</p> <p>5) The groups to present their experience of a day with the NGO and inspire students to work for the cause.</p>		
TOTAL					61 hours
	Assessment	Understand	Written Assessment of 20 marks		
		Create	Project of 20 marks (E-Magazine 4 editions)		
		Analyze, Create	Focus Group Discussion 10 marks		

S.5 Linear Algebra (BTCSH-107)

UNIT I

Introduction to Matrices and Determinants; Solution of Linear Equations; Cramer's rule; Inverse of a Matrix. UNIT II Vectors and linear combinations; Rank of a matrix; Gaussian elimination; LU Decomposition; Solving Systems of Linear Equations using the tools of Matrices.

UNIT III

Vector space; Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition

UNIT IV

Eigenvalues and Eigenvectors; Positive definite matrices; Linear transformations; Hermitian and unitary matrices;

UNIT V

Singular value decomposition and Principal component analysis; Introduction to their applications in Image Processing and Machine Learning.

TEXT BOOKS:

1. Higher Engineering Mathematics, B. S. Grewal.

REFERENCES:

1. Advanced Engineering Mathematics, 7th Edition, Peter V. O'Neil.
2. Advanced Engineering Mathematics, 2nd Edition, Michael. D. Greenberg.
3. Introduction to linear algebra, 5th Edition, Gilbert Strang.
4. Applied Mathematics (Vol. I & II) , by P. N. Wartikar& J. N. Wartikar.
5. Digital Image Processing, R C Gonzalez and R E Woods
6. <https://machinelearningmastery.com/introduction-matrices-machine-learning>

S.6 Statistical Methods (BTCSH-108)

UNIT I Sampling Techniques:

Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling.

UNIT II Linear Statistical Models:

Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation. Multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction). Estimation: Point estimation, criteria for good estimates (un-biasedness, consistency), Methods of estimation including maximum likelihood estimation.

UNIT III Sufficient Statistic:

Concept & examples, complete sufficiency, their application in estimation.

Test of hypothesis:

Concept & formulation, Type I and Type II errors, Neyman Pearson lemma, Procedures of testing.

UNIT IV Non-parametric Inference:

Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test. Tolerance region.

UNIT V Basics of Time Series Analysis & Forecasting:

Stationary, ARIMA Models:Identification, Estimation and Forecasting.

TEXT BOOKS:

1. Probability and Statistics for Engineers (4th Edition), I.R. Miller, J.E. Freund and R. Johnson.
2. Fundamentals of Statistics (Vol. I & Vol. II), A. Goon, M. Gupta and B. Dasgupta.
3. The Analysis of Time Series: An Introduction, Chris Chatfield.

REFERENCES:

1. Introduction to Linear Regression Analysis, D.C. Montgomery & E. Peck
2. Introduction to the Theory of Statistics, A.M. Mood, F.A. Graybill & D.C. Boes.
3. Applied Regression Analysis, N. Draper & H. Smith
4. Hands-on Programming with R, - Garrett Grolemund
5. R for Everyone: Advanced Analytics and Graphics, Jared P. Lander

List of Practical:

R statistical programming language:

Introduction to R, Functions, Control flow and Loops, Working with Vectors and Matrices, Reading in Data, Writing Data, Working with Data, Manipulating Data, Simulation, Linear model, Data Frame, Graphics in R

- Sem 3

S.1 Object Oriented Programming (BTCSCS-203)

UNIT I Procedural programming, An Overview of C:

Types Operator and Expressions, Scope and Lifetime, Constants, Pointers, Arrays, and References, Control Flow, Functions and Program Structure, Namespaces, error handling, Input and Output (C-way), Library Functions (string, math, stdlib), Command line arguments, Pre-processor directive

UNIT II Some difference between C and C++:

Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable, parameter passing – value vs reference, passing pointer by value or reference, #define constant vs const, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments

UNIT III The Fundamentals of Object Oriented Programming:

Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object.

More extensions to C in C++ to provide OOP Facilities:

Scope of Class and Scope Resolution Operator, Member Function of a Class, private, protected and public Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception)

UNIT IV Essentials of Object Oriented Programming:

Operator overloading, Inheritance – Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling

UNIT V Generic Programming:

Template concept, class template, function template, template specialization Input and Output: Streams, Files, Library functions, formatted output Object Oriented Design and Modelling: UML concept, Use case for requirement capturing, Class diagram, Activity diagram and Sequence Diagram for design, Corresponding C++ code from design

TEXT BOOKS:

1. **The C++ Programming Language, Bjarne Stroustrup, Addison Wesley.**
2. **C++ and Object-Oriented Programming Paradigm, Debasish Jana, PHI Learning Pvt. Ltd.**

REFERENCES:

1. **Programming – Principles and Practice Using C++, Bjarne Stroustrup, Addison Wesley.**
2. **The Design and Evolution of C++, Bjarne Stroustrup, Addison Wesley.**

List of Practical's:

1. Parameter passing: passing parameter by value vs by reference, passing array as constant pointer
2. Function overloading: writing string operations like strcat and strncat, strcpy and strncpy as overloaded functions.
3. Dynamically allocating space for a pointer depending on input and doing this repeatedly, depending on different inputs and finally de-allocating the pointer.
4. Define class complex with all possible operations: constructor, destructor, copy constructor, assignment operator with the data members stored as pointer to integers.
5. Define class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators
6. Define class matrix of integers with all possible operations like constructor, destructor, copy constructor and assignment operators
7. Define class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators
8. Define class stack, queue, linked-list, array, set using some data-type (int) with data members kept as private and functions kept in both protected and public sections.
9. Define class complex with all possible operators: constructor, destructor, copy constructor, assignment operator and operators >, =, <=, ==, ++ (pre and post), +, +=, (), with the data members stored as pointer to integers.
10. Define class vector of integers with all possible operations like constructor, destructor, copy constructor and assignment operators >, =, <=, ==, ++ (pre and post), +, +=, ()
11. Define class matrix of integers with all possible operations like constructor, destructor, copy constructor and assignment operators >, =, <=, ==, ++ (pre and post), +, +=, () .
12. Define class matrix of integers using vector, with all possible operations like constructor, destructor, copy constructor and assignment operators >, =, <=, ==, ++ (pre and post), +, +=, () .
13. Define stack and queue inherited from array class, with standard functions and operators
14. Define a class called ‘array’ with data type passed as template type with constructor, destructor, copy constructor and assignment operators and index operator.
15. Define template functions for compare and use it in the algorithms like bubble sort, insertion sort, merge sort.
16. Formatted input-output examples
17. Input manipulators
18. Overriding operators <>
19. Define class model for complex number, student class, book class and show it using UML diagram as well as concrete class.

20. Show behavioural modelling through sequence diagram and activity diagram for workflow in a typical log-in, log-out situation.

S.2 Computational Statistics (BTCSCS-204)

UNIT I Multivariate Normal Distribution:

Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters. Multiple Linear Regression Model: Standard multiple regression models with emphasis on detection of collinearity, outliers, non-normality and autocorrelation, Validation of model assumptions.

UNIT II Multivariate Regression:

Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance and covariance Discriminant Analysis: Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

UNIT III Principal Component Analysis:

Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

UNIT IV Factor Analysis:

Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

UNIT V Cluster Analysis:

Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering-Profilng and Interpreting Clusters.

TEXT BOOKS:

1. **An Introduction to Multivariate Statistical Analysis**, T.W. Anderson.
2. **Applied Multivariate Data Analysis**, Vol I & II, J.D. Jobson.
3. **Statistical Tests for Multivariate Analysis**, H. Kris.
4. **Programming Python**, Mark Lutz.
5. **Python 3 for Absolute Beginners**, Tim Hall and J-P Stacey.
6. **Beginning Python: From Novice to Professional**, Magnus Lie Hetland. Edition, 2005.

REFERENCES:

1. **Regression Diagnostics , Identifying Influential Data and Sources of Collinearety**, D.A. Belsey, E. Kuh and R.E. Welsch
2. **Applied Linear Regression Models**, J. Neter, W. Wasserman and M.H. Kutner.
3. **The Foundations of Factor Analysis**, A.S. Mulaik.
4. **Introduction to Linear Regression Analysis**, D.C. Montgomery and E.A. Peck.
5. **Cluster Analysis for Applications**, M.R. Anderberg.
6. **Multivariate Statistical Analysis**, D.F. Morrison.

7.Python for Data Analysis, Wes Mc Kinney.

List of Practical's:

Python Concepts, Data Structures, Classes:

Interpreter, Program Execution, Statements, Expressions, Flow Controls, Functions, Numeric Types, Sequences and Class Definition, Constructors, Text & Binary Files - Reading and Writing

Visualization in Python:

Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values, Patches

Multivariate data analysis:

Multiple regression, multi variate regression, cluster analysis with various algorithms, factor analysis, PCA and linear discriminant analysis. Various datasets should be used for each topic

S.3 Software Engineering (BTCSCS-205)

UNIT I Introduction:

Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; engineering approach to software development; role of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline.

UNIT II Software Project Management:

Basic concepts of life cycle models – different models and milestones; software project planning – identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

UNIT III Software Quality and Reliability:

Internal and external qualities; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126; introduction to Capability Maturity Models (CMM and CMMI); introduction to software reliability, reliability models and estimation.

UNIT IV Software Requirements Analysis, Design and Construction:

Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics based control methods; measures of code and design quality.

Object Oriented Analysis, Design and Construction:

Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object oriented construction principles; object oriented metrics.

UNIT V Software Testing:

Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction based testing; testing for non-functional requirements – volume, performance and efficiency; concepts of inspection.

TEXT BOOKS:

1. **Software Engineering**, Ian Sommerville.

REFERENCES:

1. **Fundamentals of Software Engineering**, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino.
2. **Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices**, Michael Jackson.
3. **The Unified Development Process**, Ivar Jacobson, Grady Booch, James Rumbaugh.
4. **Design Patterns: Elements of Object-Oriented Reusable Software**, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides.
5. **Software Metrics: A Rigorous and Practical Approach**, Norman E Fenton, Shari Lawrence Pfleeger.
6. **Software Engineering: Theory and Practice**, Shari Lawrence Pfleeger and Joanne M. Atlee
7. **Object-Oriented Software Construction**, Bertrand Meyer.
8. **Object Oriented Software Engineering: A Use Case Driven Approach** --Ivar Jacobson.
9. **Touch of Class: Learning to Program Well with Objects and Contracts** --Bertrand Meyer.
10. **UML Distilled: A Brief Guide to the Standard Object Modeling Language** --Martin Fowler.

List of Practical's:

Development of requirements specification, function oriented design using SA/SD, object-oriented design using UML, test case design, implementation using C++ and testing. Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle.

S.4 Financial Management (BTCSMS-206)

UNIT I Introduction :

Introduction to Financial Management - Goals of the firm - Financial Environments. Time Value of Money : Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.

UNIT II Valuation of Securities :

Bond Valuation, Preferred Stock Valuation , Common Stock Valuation, Concept of Yield and YTM. Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure

Risk, Attitudes Toward Risk,Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM)

UNIT III Operating & Financial Leverage:

Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study Cost of Capital : Concept , Computation of Specific Cost of Capital for Equity - Preference – Debt,Weighted Average Cost of Capital – Factors affecting Cost of Capital 4L Capital Budgeting : The Capital Budgeting Concept & Process - An Overview, Generating Investment ProjectProposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques,Project Evaluation and Selection - Alternative Methods

UNIT IV Working Capital Management:

Overview, Working Capital Issues, Financing Current Assets (Short Termand Long Term-Mix), Combining Liability Structures and Current Asset Decisions, Estimation of WorkingCapital.

UNIT V Cash Management:

Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts,Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring. Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, CreditReferences, Selecting optimum Credit period. 4L

TEXT BOOKS:

- 1.Brealey, Myers and Allen, Principles of Corporate Finance
- 2.Case Study Materials: To be distributed for class discussion

References Books :

1. Srivastava, Misra: Financial Management, OUP
2. Van Horne and Wachowicz : Fundamentals of Financial Management, Prentice Hall/ Pearson Education

S.5 Formal Language and Automata Theory (BTCSCS-201)

UNIT I Introduction:

Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

UNIT II Regular languages and finite automata:

Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, Kleene's theorem, pumping lemma for regular languages, Myhill-Nerode theorem and its uses, minimization of finite automata.

UNIT III Context-free languages and pushdown automata:

Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

UNIT IV Context-sensitive languages:

Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. Turing machines: The basic model for Turing machines (TM), Turing recognizable(recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

UNIT V Undecidability:

Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages. Basic Introduction to Complexity: Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines, P and NP, NP-completeness, Cook's Theorem, other NP - Complete problems.

TEXT BOOKS:

1. **Introduction to Automata Theory, Languages, and Computation** John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman.

REFERENCES:

1. **Elements of the Theory of Computation**, Harry R. Lewis and Christos H. Papadimitriou.
2. **Automata and Computability**, Dexter C. Kozen.
3. **Introduction to the Theory of Computation**, Michael Sipser.
4. **Introduction to Languages and the Theory of Computation**, John Martin.
5. **Computers and Intractability: A Guide to the Theory of NP Completeness**, M. R. Garey and D. S. Johnson.

List of Practical's:

YACC, the parser-generating tool(Chapter 5 of **Introduction to Automata Theory, Languages, and Computation** John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman.)

S.6 Computer Organization and Architecture (BTCSCS-202)

UNIT I Revision of basics in Boolean logic and Combinational/Sequential Circuits. Functional blocks of a computer:

CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

UNIT II Data representation:

Signed number representation, fixed and floating point representations, character representation. Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

UNIT III Introduction to x86 architecture.

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU. Memory system design: Semiconductor memory technologies, memory organization.

UNIT IV Peripheral devices and their characteristics:

Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT V Pipelining:

Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency. Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

TEXT BOOKS:

1. Computer System Architecture M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
3. Computer Organization and Embedded Systems, Carl Hamacher.

REFERENCES:

1. Computer Architecture and Organization, John P. Hayes.
2. Computer Organization and Architecture: Designing for Performance, William Stallings.
3. Computer System Design and Architecture, Vincent P. Heuring and Harry F. Jordan.

List of Practical's:

1. Circuits on breadboard or simulators
 - (a) Implementation of Combinational Digital/Boolean Circuits: Adder, Subtractor, Multiplication Module, Division Module, Multiplexer, Demultiplexer, Encoder, Decoder.
 - (b) Implementation of Sequential Circuits: Counters, Linear Feedback Shift Registers (LFSR)
2. C/C++ programming to understand the formats of char, int, float, double, long etc.
3. Machine language programming on x86 or higher version kits or simulators:
 - (i) Add/subtract/multiplication/division/GCD/LCM
 - (ii) Accessing some specific memory locations/ports

- (iii) Counting odd and even integers from a series of memory locations
- (iv) Printing values of selected registers
- (v) Handing interrupts

- Sem 4

S.1 Database Management Systems (BTCSCS-210)

UNIT I Introduction:

Introduction to Database. Hierarchical, Network and Relational Models. Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

UNIT II Data models:

Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations. Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

UNIT III Relational database design:

Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

UNIT IV Storage strategies:

Indices, B-trees, Hashing. Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multiversion and optimistic Concurrency Control schemes, Database recovery.

UNIT V Database Security:

Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

TEXT BOOKS:

1. **Database System Concepts.** Abraham Silberschatz, Henry F. Korth and S. Sudarshan.

REFERENCES:

1. **Principles of Database and Knowledge – Base Systems,** Vol 1 by J. D. Ullman.
2. **Fundamentals of Database Systems.** R. Elmasri and S. Navathe.
3. **Foundations of Databases.** Serge Abiteboul, Richard Hull, Victor Vianu.

S.2 Software Design with UML (BTCSCS-211)

UNIT I

Introduction to on Object Oriented Technologies and the UML Method.

- Software development process: The Waterfall Model vs. The Spiral Model.
- The Software Crisis, description of the real world using the Objects Model.
- Classes, inheritance and multiple configurations.
- Quality software characteristics.
- Description of the Object Oriented Analysis process vs. the Structure Analysis Model.

Introduction to the UML Language.

- Standards.
- Elements of the language.
- General description of various models.
- The process of Object Oriented software development.
- Description of Design Patterns.
- Technological Description of Distributed Systems.

UNIT II

Requirements Analysis Using Case Modeling

- Analysis of system requirements.
- Actor definitions.
- Writing a case goal.
- Use Case Diagrams.
- Use Case Relationships.

Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams.

- Description of goal.
- Defining UML Method, Operation, Object Interface, Class.
- Sequence Diagram.
- Finding objects from Flow of Events.
- Describing the process of finding objects using a Sequence Diagram.
- Describing the process of finding objects using a Collaboration Diagram.

UNIT III

The Logical View Design Stage: The Static Structure Diagrams.

- The Class Diagram Model.
- Attributes descriptions.
- Operations descriptions.
- Connections descriptions in the Static Model.
- Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.
- Package Diagram Model.**
- Description of the model.
- White box, black box.
- Connections between packagers.
- Interfaces. • Create Package Diagram.
- Drill Down.

UNIT IV

Dynamic Model: State Diagram / Activity Diagram.

- **Description of the State Diagram.** • Events Handling.
 - **Description of the Activity Diagram.**
 - **Exercise in State Machines. Component Diagram Model.**
 - **Physical Aspect.**
 - **Logical Aspect.**
 - **Connections and Dependencies.**
 - **User face.**
-
- **Initial DB design in a UML environment.**

UNIT V

Deployment Model. • Processors.

- **Connections.**
- **Components.**
- **Tasks.** • **Threads.**
- **Signals and Events.**

TEXT BOOKS:

1. **Object-Oriented Software Engineering: using UML, Patterns, and Java.** Bernd Bruegge and Allen H. Dutoit.

REFERENCES:

1. **Design Patterns: Elements of Reusable Object-Oriented Software.** Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides.

S.3 Introduction to Innovation, IP Management and Entrepreneurship (BTCSIIE-212)

UNIT I Innovation:

What and Why? Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations. Class Discussion- Is innovation manageable or just a random gambling activity?

UNIT II

Building an Innovative Organization Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture Class Discussion- Innovation: Co-operating across networks vs. ‘go-it-alone’ approach

UNIT III

Entrepreneurship:

- **Opportunity recognition and entry strategies**
- **Entrepreneurship as a Style of Management**
- **Maintaining Competitive Advantage- Use of IPR to protect Innovation**

UNIT IV

Entrepreneurship- Financial Planning:

- **Financial Projections and Valuation**
- **Stages of financing • Debt, Venture Capital and other forms of Financing Intellectual Property Rights (IPR)**
- **Introduction and the economics behind development of IPR: Business Perspective**
- **IPR in India – Genesis and Development**
- **International Context**
- **Concept of IP Management, Use in marketing**

UNIT V

Types of Intellectual Property

- **Patent- Procedure, Licensing and Assignment, Infringement and Penalty**
- **Trademark- Use in marketing, example of trademarks- Domain name**
- **Geographical Indications- What is GI, Why protect them?**
- **Copyright- What is copyright**
- **Industrial Designs- What is design? How to protect? Class Discussion- Major Court battles regarding violation of patents between corporate companies**

TEXT BOOKS:

1. **Joe Tidd, John Bessant. Managing Innovation: Integrating Technological, Market and Organizational Change**
2. **Case Study Materials: To be distributed for class discussion**

List of Practical's:

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class. Further, the topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

Topic 1- Is innovation manageable or just a random gambling activity?

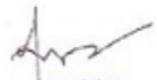
Topic 2- Innovation: Co-operating across networks vs. ‘go-it-alone’ approach

Topic 3- Major Court battles regarding violation of patents between corporate companies

S.4 Business Communication and Value Science – III (BTCSIIIE-213)

Leadership Oriented Learning (LOL)		
Nature of Course		Behavioral
Pre requisites		Basic Knowledge of English (verbal and written) Completion of all units from Semesters 1, 2 and 3
Course Objectives:		
1	Develop technical writing skills	
2	Introduce students to Self-analysis techniques like SWOT & TOWS	
3	Introduce students to key concepts of: a) Pluralism & cultural spaces b) Cross-cultural communication	


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	c) Science of Nation building
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Course Outcomes:

Upon completion of the course, students shall have ability to

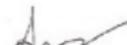
C2.6.1	Apply & analyze the basic principles of SWOT & life positions.	[U]
C2.6.2	Understand, analyze & leverage the power of motivation in real life	[AP]
C2.6.3	Identify & respect pluralism in cultural spaces	[AP]
C2.6.4	Understand and apply the concepts of Global, glocal and translocational	[C]
C2.6.5	Analyze cross cultural communication	[U]
C2.6.6	Apply the science of Nation building	[AP]
C2.6.7	Identify the common mistakes made in cross-cultural communication	[E]
C2.6.8	Understand, apply & analyze the tools of technical writing	[U]
C2.6.9	Recognize the roles and relations of different genders.	[AP]
C2.6.10	Understand Artificial intelligence & recognize its impact in daily life	[U]
C2.6.11	Identify the best practices of technical writing	[AP]
C2.6.12	Differentiate between the diverse culture of India	[E]

Course Contents:

Objectives for Semester 4

After completing this semester, learners will be able to:

- Summarize the basic principles of SWOT and Life Positions.
- Apply SWOT in real life scenarios.
- Recognize how motivation helps real life.
- Leverage motivation in real-life scenarios.
- Identify pluralism in cultural spaces.
- Respect pluralism in cultural spaces.
- Differentiate between the different cultures of India.
- Define the terms global, glocal and translocational.
- Differentiate between global, glocal and translocational culture.
- Recognize the implications of cross-cultural communication.
- Identify the common mistakes made in cross-cultural communication.
- Apply cross-cultural communication.
- Differentiate between the roles and relations of different genders.
- Summarize the role of science in nation building.



- Define AI (artificial intelligence).
- Recognize the importance of AI.
- Identify the best practices of technical writing.
- Apply technical writing in real-life scenarios.

Total Hours:

48 hours

Text Books:

	There are no prescribed texts for Semester 4 – there will be handouts and reference links shared.
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Reference Books:

1	
2	
3	
4	

Web References:

1	Examples of Technical Writing for Students https://freelance-writing.lovetoknow.com/kinds-technical-writing
2	11 Skills of a Good Technical Writer https://clickhelp.com/clickhelp-technical-writing-blog/11-skills-of-a-good-technical-writer/
3	13 benefits and challenges of cultural diversity in the workplace https://www.hult.edu/blog/benefits-challenges-cultural-diversity-workplace/

Online Resources:

1	https://youtu.be/CsaTslhSDI
2	https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3	https://m.youtube.com/watch?feature=youtu.be&v=c80BbX05D7Y
4	https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
5	https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be



Assessment Methods & Levels (based on Bloom's Taxonomy)			
Formative assessment (Max. Marks:20)			
Course Outcome	Bloom's Level	Assessment Component	Marks
C1.6.1	Analyze	SWOT in real life	5
C1.6.2	Analyze	Motivation in real life	4

Summative Assessment based on End Semester Project			
Bloom's Level			
Understand	Written Assessment, project and group discussion		50
Apply			
Analyze			

Lesson Plan

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			Guest lecture by a renowned personality to kick start this semester.	This will be outside the total hours for this Semester	90 mins
1			<p>REUNION</p> <p>Recap activity on the earlier learning after a 6 months break.</p> <p>If we can flash the projects they completed in the last semester.....</p> <p>End with a Quiz in multiple format rounds testing the objectives.</p>	Activity	60 Minutes
1	Summarize the basic principles of SWOT and Life Positions.	2	<p>SWOT and Life Positions</p> <p>Meet Dananjaya: Meet Dananjaya Hettiarachchi The World Champion of Public Speaking 2014 who made the winning speech which was</p>	Lecture and activity	60 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			<p>rated amongst the “Most talked-about speeches of 2014”.</p> <p>https://www.youtube.com/watch?v=bbz2boNSeL0&t=24s</p> <p>Debrief on the video. How it relates to SWOT.</p> <p>Intro activity: Give story of an individual* and divide people into 4 groups S W O T and ask them to jot down the SWOT. Start with a different nomenclature (demystifying SWOT)</p>		
1	Apply SWOT in real life scenarios.	3	<p>Pat your back activity...strength will be written by others other points by you</p> <p>Create your SWOT</p>	Practical	60 Minutes
1	Apply SWOT in real life scenarios.	3	<p>SWOT Vs. TOWS The Balancing Act</p> <p>Ted talk on biomimicry: (Only first 8 mins): https://www.youtube.com/watch?v=RHrO4t86phA</p> <p>Debrief on the Ted talk in which the facilitator gently guides the group towards the understanding that survival happens only when we seek ideas from the external world to turn the threat into opportunity</p> <p>Research on TOWS and find</p>	Lab	120 minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			out how you can turn your threat into opportunity. Two people mutually identifying opportunities from each other's threats.		
1	Apply SWOT in real life scenarios.	3	Presentation on what are the strengths they have identified to survive in the VUCA World. Group presentations of 10 mins each.	Formative evaluation	90 mins
1	Recognize how motivation helps real life.	1	Motivation Stories YouTube videos on Maslow's Theory	Lecture and activity	90 mins
1	Leverage motivation in real-life scenarios.	3	Scenario based activity on identifying and leveraging motivation	Formative evaluation/Lab	60 mins
1	Recognize how motivation helps real life.	1	Present their findings and approaches as groups. They need to explain the idea of motivation with the help of examples.	Practical	60 mins
Unit 2					
2	Identify pluralism in cultural spaces.	1	Rivers of India a. Divide participants into groups of 5. Each group should assign themselves a name from the Indian Rivers. These groups will continue throughout this Unit. b. Learn and Exchange Group activity in which participants need to learn the following four greetings of a state (different from their own) and exchange it with another group: • Good morning	Activity	90 Minutes

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			<ul style="list-style-type: none"> • Thank you • Sorry • Good night Indicative only		
2	Identify pluralism in cultural spaces. Respect pluralism in cultural spaces.	2 3	a. Awareness and respect for pluralism in cultural spaces b. Announce the Rhythms of India activity to be held in the next session. The rules of the activity will be detailed at this point. Teams to prepare for the performance beyond class hours.	Theory/Discussion using Phir Miley Sur Mera Tumhara	90 Minutes
2	Differentiate between the different cultures of India.	2	Rhythms of India (Cultures in India) Group activity: Each group to perform a short dance piece (3 mins) from any of the Indian states (to be decided by lots). They have to present the background and unique features of the dance form (5 min).	Practical/Discussion	120 Minutes
2	<ul style="list-style-type: none"> • Define the terms global, glocal and transnational. • Differentiate between global, glocal and transnational culture. 	1, 2	a. Global, glocal, transnational Use Ted and YouTube videos to show examples b. Announce debate to be held in the next session. They have to come prepared for the debate/discussion.	Lecture/Discussion	60 mins
2	Differentiate between global, glocal and transnational culture.	2	Debate on Global, glocal, transnational impacts (topics to be decided by the faculty or suggested by the students). Debate to be held in the presence of an external moderator.	Activity	60 mins

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			Eight groups will get four topics to debate upon.		
2	<ul style="list-style-type: none"> • Recognize the implications of cross-cultural communication. • Identify the common mistakes made in cross-cultural communication. 	1, 2	<p>Cross-cultural communication</p> <p>A. Verbal and non-verbal communication (approach is through videos). Point out the obvious mistakes. From our perspective...how anyone would feel if someone else made mistakes about our cultures.</p> <p>B. Let participants have a group discussion on the implications of cross cultural communication.</p>	Lecture/Discussion	60 mins
2	Apply cross cultural communication.	3	Suggested long-term activity: A VR game in which learners can visit different locations of the world and overcome challenges by using cross cultural skills.		
2	Identify the common mistakes made in cross-cultural communication	2	<p>Culture shock</p> <p>Group activity to perform skits based on situations provided by the lecturer.</p>	Practical	60 mins
2	Differentiate between the roles and relations of different genders.	2	<p>Gender awareness</p> <p>Participants will view relevant scenarios in the class and then participate in a reflection activity in group. The scenarios can be presented using an Augmented Reality intervention.</p>	Discussion	90 mins

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
2	Differentiate between the roles and relations of different genders.	2	<p>Gender awareness campaign</p> <p>Groups to present the detailed plan of Gender awareness campaigns with four different themes.</p> <ul style="list-style-type: none"> • College • Workplace • Family • Friends 	Activity	60 mins
2			Quiz Time	Summative Evaluation for Unit	60 Minutes
Unit 3					
3	Summarize the role of science in nation building.	2	<p>Role of science in nation building</p> <p>Introduce the topic and discuss the role of scientists and mathematicians from ancient India.</p> <p>Break the students into groups and give them ten minutes to access internet and get information about ten eminent scientists and mathematicians of ancient India. Groups will be given five minutes to present on the next day. Groups will also frame two questions which they will ask after presenting.</p> <p>This can also be taught through Augmented Reality, where images of the scientists will be put up around the class and they will be able to gather the information by using their phones and AR app.</p>	Theory and lab	90 mins

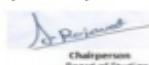
Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			<p>Groups present their findings.</p> <p>Other groups note down their learning.</p> <p>At the end there will be a quiz to assess their learning.</p>	Activity	90 mins
	Summarize the role of science in nation building.	2	<p>Role of science post-independence</p> <p>Groups to present using multiple formats on any one of the four given topics.</p> <ul style="list-style-type: none"> • Inventions • Inventors • Institutes • Information technology 	Lab and practical	120 mins
	Identify the best practices of technical writing.	1	<p>Introduction to technical writing</p> <p>Basic rules of technical writing through examples.</p>	Lecture (Guest faculty, over webinar)	60 mins
	Identify the best practices of technical writing.	1	Practice activity on technical writing.	Lab	60 mins
	Apply technical writing in real-life scenarios.	3	<p>Assessment on technical writing on the following topic:</p> <p>Explain the following to a visually impaired person:</p> <ul style="list-style-type: none"> • DNA • Rings of Saturn • Structure of an oxygen atom • Structure of heart 	Summative evaluation	60 mins

Unit 4


Chairperson
Research Foundation



Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
4	Define AI (artificial intelligence).	1	"Voice of the Future" Activity How will a voice assistant evolve in 25 years from now? Each group will present a skit.	Activity	90 mins
	Recognize the importance of AI.	1	AI in Everyday Life Discussion in groups on given topics and then cross sharing of discussion points amongst the groups.	Lab and Activity	90 mins
	Recognize the importance of AI.	1	Design your college in the year 2090 Groups need to create the college of future with the future teachers, teaching methods, types of students, etc. We will end the session with the question: How will offices/workplaces change in future? Who do you think would be your colleagues?	Lab and Practical	90 mins
	Recognize the importance of AI.	1	Communicating with machines Theory and Ted talk videos	Lecture	60 mins
	Recognize the importance of AI.	1	Debate in the presence of an external moderator. Will machines control us in future?	Discussion	90 mins
	Identify the best practices of technical writing.	1	Applying technical writing in profession Theory with YouTube and Dr Bimal Ray's videos. Dr Bimal Kumar Roy, a former Director of the Indian Statistical Institute, is a cryptologist from the	Lecture	90 mins


Dr. Bimal Roy
Chairperson
Board of Studies
Information Technology & Engineering,
Information Technology & Computer Applications)


Joint Registrar
Information Technology & Engineering,
Information Technology & Computer Applications)

Unit No	Objective	Bloom's Level	Content	Type of Class	Duration
			Cryptology Research Group of the Applied Statistics Unit of ISI, Kolkata.		
	Apply technical writing in real-life scenarios.	3	<p>Scenario-based Assessment on technical writing</p> <p>Each group will make a presentation on the following:</p> <ul style="list-style-type: none"> a) Sell Analytics and Insight to the local tea seller. b) Explain the concept of Cloud to your 87 year old grandmother. c) Introduce the concept of friendly robots to a class 3 kid. <p>Explain IOT to your helping hand at home</p>	Summative evaluation	60 mins
Project					
			Visit rural area/ underprivileged parts of city to address some of the local issues; if relevant, suggest a practical technology solution to the issues.	Project	10 hours

S.5 Operations Research (BTCSMS-214)

UNIT I Introduction to OR:

Origin of OR and its definition. Concept of optimizing performance measure, Types of OR problems, Deterministic vs. Stochastic optimization, Phases of OR problem approach – problem formulation, building mathematical model, deriving solutions, validating model, controlling and implementing solution.

UNIT II Linear Programming:

Linear programming – Examples from industrial cases, formulation & definitions, Matrix form. Implicit assumptions of LPP. Some basic concepts and results of linear algebra – Vectors, Matrices, Linear Independence/Dependence of vectors, Rank, Basis, System of linear eqns., Hyperplane, Convex set, Convex polyhedron, Extreme points, Basic feasible solutions. Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy & degeneracy, Sensitivity analysis. Simplex Algorithm – slack, surplus & artificial variables, computational details, big-M method, identification and resolution of special cases through simplex iterations. Duality – formulation, results, fundamental theorem of duality, dual-simplex and primal-dual algorithms.

UNIT III Transportation and Assignment problems:

TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations, Solution methods – NWCR, minimum cost and VAM, test for optimality(MODI method), degeneracy and its resolution. AP - Examples, Definitions – decision variables, constraints, formulation, Balanced &unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

UNIT IV PERT – CPM:

Project definition, Project scheduling techniques – Gantt chart, PERT & CPM, Determination ofcritical paths, Estimation of Project time and its variance in PERT using statistical principles, Conceptof project crashing/time-cost trade-off. Inventory Control: Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics ofinventory policy (order, lead time, types), Fixed order-quantity models – EOQ, POQ & Quantitydiscount models. EOQ models for discrete units, sensitivity analysis and Robustness, Special cases ofEOQ models for safety stock with known/unknown stock out situations, models under prescribedpolicy, Probabilistic situations.

UNIT V Queuing Theory:

Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) ofqueuing system, queue types (channel vs. phase). Kendall's notation, Little's law, steady state behaviour, Poisson's Process & queue, Models with examples - M/M/1 and its performance measures; M/M/m and its performance measures; brief description aboutsome special models. Simulation Methodology: Definition and steps of simulation, random number, random number generator, Discrete EventSystem Simulation – clock, event list, Application in Scheduling, Queuing systems and Inventory systems.

TEXT BOOKS:

1. Operations Research: An Introduction.H.A. Taha.

REFERENCES:

1. Linear Programming. K.G. Murthy.
 2. Linear Programming. G. Hadley.
 3. Principles of OR with Application to Managerial Decisions. H.M. Wagner.
 4. Introduction to Operations Research. F.S. Hiller and G.J. Lieberman.
 5. Elements of Queuing Theory. Thomas L. Saaty.
 6. Operations Research and Management Science, Hand Book: Edited By A. Ravi Ravindran.
 7. Management Guide to PERT/CPM. Wiest & Levy.
 8. Modern Inventory Management. J.W. Prichard and R.H. Eagle.
- S.6 Operating Systems (BTCSCS-209)

UNIT I Introduction:

Concept of Operating Systems (OS), Generations of OS, Typesof OS, OS Services, Interrupt handling andSystem Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.

Processes:

Definition, Process Relationship, Different states of a Process, Process Statetransitions, Process Control Block (PCB), Context switching.

Thread:

Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT II Process Scheduling:

Foundation and Scheduling objectives, Types of Schedulers,

Scheduling criteria:

CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT III

Inter-process Communication:

Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Barber's shop problem.

Deadlocks:

Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Concurrent Programming:

Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

UNIT IV Memory Management:

Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU). I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

UNIT V File Management:

Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks. Case study: UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

TEXT BOOKS:

1. **Operating System Concepts Essentials.** Abraham Silberschatz, Peter Baer Galvin and Greg Gagne

REFERENCES:

1. **Operating Systems: Internals and Design Principles.** William Stallings.

2. **Operating System: A Design-oriented Approach.** Charles Patrick Crowley.
3. **Operating Systems: A Modern Perspective.** Gary J. Nutt.
4. **Design of the Unix Operating Systems.** Maurice J. Bach.
5. **Understanding the Linux Kernel, Daniel Pierre Bovet, Marco Cesati.**

7) B.tech (BDCE- Impetus Technologies)

- Sem 1

S.1 Web Development Lab-I(HTML & XML) (BTIT-307)

UNIT I Introduction to HTML:

What is HTML, HTML Documents, SGML, Basic structure of an HTML document, creating an HTML document, Headers tags, Body tags, Paragraphs formatting, Text Elements, Tag Elements, Special Character elements, Image tags, HTML Table tags and lists: Numbered list, Non- Numbered lists, Definition lists, Anchor tag, Name tag, Hyperlinks – FTP/HTTP/HTTPS, Links with images and buttons, Links to send email messages, Text fonts and styles, background colors/images, Marquee Behavior, Forms related tags. (Action, method, name, inputetc.)

UNIT II HTML5:

Introduction of HTML5, Browser supports, Migration from HTML4 to HTML5, New Elements in HTML5, HTML5 different parts layout of a web page, HTML5 Graphics: Canvas, SVG, HTML Media Tags: Inserting audio files, Inserting video files, Screen control attributes, Media control attributes, HTML Object.

UNIT III CSS:

Introduction of CSS, CSS Syntax CSS Id & Class. CSS Styling: styling Backgrounds, styling Text, styling Fonts, styling Links, styling Lists, styling Tables. CSS Box Model: Border, Outline, Margin, Padding. CSS Advanced: Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image capacity, Image Sprites, Media Types, and Attribute Selectors.

UNIT IV XML:

Introduction of XML, Cross scripting of XML, XML as intermediate language, Difference between XML and HTML, XML DOM, Tree, Syntax, Elements, Attributes, Namespaces, XPath, XML DTD, Applications, XQuery, XML Schema, XML Parser, XHTML: Introduction of XHTML, XHTML rules over the HTML, conversation HTML to XHTML.

UNIT V Java Script:

Introduction to client side scripting, Server side scripting, Java Script Syntax, Variables and Functions, Operators: JavaScript Arithmetic Operators, JavaScript Assignment Operators, JavaScript Popup Boxes, JavaScript Window, Events and Objects, JavaScript Function Call, Validation in webpages, Introduction of AJAX

Text Books:

1. Jennifer Niederst Robbins. **Learning Web Design, Fifth Edition**, O'Reilly Media, Inc, May 2018.
2. Frain and Ben. **Responsive Web Design with HTML5 and CSS3, Second Edition**, 2015.
3. Nicholas c.Zakas. **Java Script for Web Developers, Third edition**, 2012.
4. George Q. Huang, K. L Mak. **Internet Applications in Product Design and Manufacturing**, ISBN: 3540434658, 2003 edition, springer, 2012.

Reference Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible", Fifth Edition, WileyIndia, 2010.
2. John Duckett,"Beginning HTML, XHTML, CSS, and JavaScript ",WileyIndia, 2010.
3. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design",3rd edition, Wiley India, 2011.
4. Achyut S. Godbole, Atul Kahate, **Web Technologies**, ISBN: 9781259062681,3rd edition, TMH, 2013.

List of Practical:

1. Design a Web Page, Insert an image on to the web page such that image is of height 300 and width 300 pixels. The image should have an ALT text in it.
2. Create a Web page that holds a bulleted list of the names of your friends. Make sure that the bullets are in plain circle.
3. Create a Frame which would hold both the web page that was created earlier. The frame should be split row-wise into equal halves.
4. Create a Web Page to display the marks you got in all subjects of last semester using table.
5. Create a Form having two boxes with labels as First Name and Last Name. The User should not be allowed to enter the names directly in the text boxes. The input has to be given in the prompt box and then entered values should be given in the textboxes.
6. Create a Web Page that has a button in the center of the page. Using mouse events change the Message in the statusbar.
7. Design a Web page that accepts Username and Password. Opens a new window when the password corresponds to a particular value is set by the developer
8. Design a Web page that consists of 2 text boxes. When the page is first loaded set the focus to the first textbox. The user should not be allowed to leave the box unless enters a value in it.
9. To convert the HTML code to XHTML code.
10. To study the XML tree.
11. To study of Dreamweaver Tool.
12. To study of a Flash Animation Tool.

S.2 Programming Skills with 'C' (BTCS-108)

Unit - 1 Introduction to Programming:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals of Algorithms, Flow Charts.

UNIT II Programming using C:

C data types, int, char, float etc, C Expressions, Arithmetic Operation, Relational and Logic Operations, C Assignment Statements, Extension of Assignment of The Operations, C Primitive Input Output Using getchar and putchar, Exposure to the scanf and printf functions, C Statements, conditional executing using if, else, Optionally Switch and Break Statements may be mentioned.

UNIT III Iterations and Subprograms:

Concept of loops, Example of Loops in C Using for, while and do-while, Optionally continue may be mentioned, One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations, Concept of Sub-programming, functions Example of functions, Argument passing mainly for the simple variables.

UNIT IV Pointers and Strings:

Pointers, Relationship Between Arrays and Pointers Argument passing using Pointers Array of Pointers, Passing arrays as Arguments, Strings and C String Library.Structure and Unions, Defining C structures, Passing Strings as Arguments Programming Examples.

Unit –V File handling:

Console Input Output Functions, Disk Input Output Functions, Data files, Command Line Arguments, Bitwise Operators, Enumerated Data Types, Type Casting, macros, The C Preprocessor, More About library Functions.

Reference Books:

1. E Balaguruswamy , Object Oriented Programming With C++ , 4th Edition , TMH, 2008
2. Brian W. Kernighan and Dennis M. Ritchie ,“The C Programming Language”, 2nd Edition, Prentice-Hall India, New Delhi, 2002
3. Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2000
4. H. Cooper and H. Mullish, Jaico Publishing House. “Spirit of C”, 4th Edition, Jaico Publishing House, 2006

List of Practical:

1. Write a program to produce ASCII equivalent of given number.
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user
 - I $(ax+b)/(ax-b)$
 - II $(x^5+10x^4+8x^3+4x+2)$
4. Write a program to find sum of a geometric series.
5. Write a program to cipher a string.
6. Write a program to check whether a given string follows English capitalization rules.
7. Write a program to find sum of the numerical series.
8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.
9. Write a recursive program for tower of Hanoi problem

- 10.**The fibonacci sequence of numbers is 1,1,2,3,5,8..... Based on the recurrence relation
 a. $F(n)=F(n-1)+F(n-2)$ for $n>2$
 b. Write a recursive program to print the first m Fibonacci number
- 11.**Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
 a) Addition of two matrices
 b) Subtraction of two matrices
 c) Finding upper and lower triangular matrices
 d)Trace of a matrix
 e) Transpose of a matrix
 f) Check of matrix symmetry
 g) Product of two matrices.
- 12.**Write a program that takes two operands and one operator from the user perform the operation and then print the answer.
- 13.**Write a program to print pyramid.
- 14.**Write functions to add, subtract, multiply and divide two complex numbers $(x+iy)$ and $(a+ib)$ Also write the main program.
- 15.**Write a program to copy one file to other, use command line arguments.
- 16.**Write a program to mask some bit of a number (using bit operations).
- 17.**An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

S.3 Mathematics – (BTMACS-101)

UNIT I Differential Calculus:

Limits of functions, continuous functions, uniform continuity, monotone and inverse functions. Differentiable functions, Rolle's theorem, mean value theorems and Taylor's theorem, power series. Functions of several variables, partial derivatives, chain rule, Tangent planes and normals. Maxima, minima, saddle points, Lagrange multipliers, exact differentials

UNIT II Integral Calculus:

Riemann integration, fundamental theorem of integral calculus, improper integrals. Application to length, area, volume, surface area of revolution. Multiple integrals with application to volume, surface area, Change of variables.

UNIT III Numerical Analysis:

Number Representation and Errors: Numerical Errors; Floating Point Representation; Finite Single and Double Precision Differences; Machine Epsilon; Significant Digits. Numerical Methods for Solving Nonlinear Equations: Method of Bisection, Secant Method, False Position, Newton-Raphson's Method, Multidimensional Newton's Method, Fixed Point Method and their convergence.

UNIT IV Numerical Methods for Solving System of Linear Equations:

Norms; Condition Numbers, Forward Gaussian Elimination and Backward Substitution; Gauss-Jordan Elimination; FGE with Partial Pivoting and Row Scaling; LU Decomposition; Iterative Methods: Jacobi, Gauss Siedal; Power method and QR method for Eigen Value and Eigenvector.

UNIT V Vector Calculus:

Gradient and directional derivative. Divergence and Curl of Vector point function, line and surface integrals. Green“s, Gauss“ and Stokes“ theorems and their applications.

Text Books:

26. T. M. Apostol, Calculus, Volume I, 2nd Ed, Wiley, 1967.
27. T. M. Apostol, Calculus, Volume II, 2nd Ed, Wiley, 1969.
28. K. E. Atkinson, Numerical Analysis, John Wiley, Low Price Edition(2004).
29. S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 2005.
30. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

Reference Books:

31. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.
32. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
33. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
34. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, 2001.
35. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
36. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill, 2008.

S.4 APPLIED PHYSICS(BTPH-101)

UNIT I Quantum Physics:

Introduction to Quantum hypothesis, Matter wave concept, Wave Group and Particle velocity and their relations, Uncertainty principle with elementary proof and applications to microscope and single slit, Compton Effect, Wave function and its physical significance. Development of time dependent and time independent Schrodinger wave equation, Applications of time independent Schrodinger wave equation.

UNIT II Solid State Physics:

Free electron model, Qualitative Analysis of Kronig Penney Model, effective mass, Fermi level for Intrinsic and Extrinsic semiconductors, P-N junction diode, Zener diode, Tunnel diode, Photodiode, Solar- cells, Hall Effect, Introduction to Superconductivity, Meissner effect, Type I & II Superconductors.

UNIT III Nuclear Physics:

Nuclear Structure & Properties Nuclear models: Liquid drop with semiempirical mass formula & shell model. Particle accelerators: Cyclotron, Synchrotron, Betatron. Counters

and Detectors: Giger-Muller counters, Bainbridge Mass Spectrograph and Auston Mass Spectrograph.

UNIT IV Laser & Fiber Optics:

Stimulated and Spontaneous Emission, Einstein's A&B Coefficients, Population Inversion, Pumping, Techniques of Pumping, Optical Resonator, Properties and Applications of Laser, Ruby, Nd:YAG, He-Ne lasers. Introduction to Optical fibre, Acceptance angle and cone, Numerical Aperture, V- Number, Ray theory of propagation through optical fibre, Pulse dispersion , applications of optical fibre.

UNIT V Wave Optics:

Introduction to Interference, Fresnel's Bi-prism, Interference in Thin films, Newton's rings experiment, Michelson 's interferometer and its application, Introduction to Diffraction and its Types, Diffraction at single slit, double slit, resolving power, Rayleigh criterion, Resolving power of grating, Concept of polarized light, Double refraction, quarter and half wave plate, circularly & elliptically polarized light.

Text Books:

1. Engineering Physics by Dr. S. L. Gupta and Sanjeev Gupta, Dhanpat Rai Publication, New Delhi.
2. Engineering Physics by Navneet Gupta, DhanpatRai Publication, New Delhi.
3. Engineering Physics by H. J. Sawant, Technical Publications, Pune, Maharastra.
4. Engg Physics by M.N. Avdhanulu& P.G. Kshirsagar, S.Chand&Co.Edition (2010).
5. Fundamentals of Physics by Halliday, Wiley, India.

Reference Books:

1. Concepts of Modern Physics by Beiser, TMH, New Delhi.
2. Solid State Physics by Kittel,Wiley India.
3. Atomic and Nuclear physics by Brijlal and Subraminiyan.
4. LASERSs and Electro Optics by Christopher C. Davis, Cambridge Univ. Press (1996).
5. Optoelectronics an Introduction by J. Wilson &J.F.B.Hawkes, " Prentice-Hall II Edition.
6. LASER theory and applications by A. K. Ghatak&Tyagarajan, TMH (1984). 7. Optics by Ghatak, TMH.

List of Practical:

1. Measurement of radius of curvature "R" of convex lens by Newton"s ring experiment.
2. Measurement of Numerical aperture of fiber by LASER.
3. Determination of Energy band gap „Eg“ of Ge using Four Probe method.
4. Measurement of Frequency of A.C. mains by electrically maintained vibrating rod.
5. Measurement of Resolving Power of Telescope.
6. Measurement of “ λ ” of LASER light source using Diffraction Grating.
7. Determination of Planck"s constant by using photocell.
8. Determination of Energy band gap (Eg) using PN Junction Diode.
9. To determine the mass of cane sugar dissolved in water using half shade polarimeter.
10. To study forward and reverse characteristics of Zener diode.

S.5 Introduction to Computer Science and Engineering(BTCS-102)

UNIT I Introduction to Computer Fundamentals:

Introduction: What is Computer, Objectives, Hardware and software, Block Diagram of The Computer, Functions of the different Units, CPU(Central Processing Unit), Input unit, Output unit, Memory, Storage Devices, Representation of data and information, Computer Languages, Machine language, Assembly language, High level language, Number System and Conversion, Classification of Computers, History and Generations of Computer, Types of Computers, Characteristics of Computers, Introduction to Free and Open Source Software, Definition of Computer Virus, Types of Viruses, Use of Antivirus software. Applications of Computers: Home, Education and Training, Entertainment, Science, Medicine, Engineering etc.

UNIT II The Operating System:

The Graphical User Interface (GUI), Definition of Operating System, Objective, Types and functions of Operating Systems, Windows Operating System, Installing MS Windows, Working with Windows Operating System, System Tools and Applications in windows, MS-DOS (Disk Operating System), Basic DOS commands, Switching Between DOS and Windows, Comparison of DOS and Windows, System Tools and Applications in MS-DOS, Other Operating Systems Unix, Linux etc.

UNIT III Office Automation Tools-I:

Word Processing Basics, Elements of word Processing and Working, MS-Office (Word, Access, Outlook, Front page etc), Objectives, Starting MS-Word, MS-Word Screen and its Components, Working with MS-Word, Menu Bar, Creating Documents, Using Templates, Saving a documents, Working with documents, Setting up pages of a document, Printing Documents with different options, Using Tables and Columns, Object Linking and Embedding, Hyperlink, Envelopes & Label Creation, Grammar & Spell Check, Mail Merge, Macro Creation, Previewing and Printing Documents.

UNIT IV Office Automation Tools-II:

Spread Sheet: Introduction to MS-Excel, Starting MS-Excel, Basics of Workbook and Spreadsheet, MS-Excel Screen and Its Components, Features of Excel, Elementary Working with MS-Excel, Manipulation of cells, Formatting of Spreadsheet and Cells, Formulas and Functions, Spread sheets for Small accountings, Previewing and Printing a Worksheet.
Power-point: Introduction to MS-PowerPoint, Starting MS-PowerPoint, Basics of PowerPoint, MS PowerPoint Screen and Its Components, Features of PowerPoint, Elementary, Elementary Working with MS-PowerPoint, Preparation of Slides, Creation of Presentation, Providing aesthetics, Slide Manipulation and Slide Show, Presentation of the Slides.

UNIT V Computer Communication and Internet:

Computers and Communication: Introduction to Computer Networks, Internet and World Wide Web, Communication and Collaboration(Electronic Mail), Basic of electronic mail, Web Browsers and Servers, Introduction to HTML, Use of Computer in Commerce,

Internet Applications, Electronic Data Interchange, Electronic Payment System, Internet Security, Privacy, Ethical Issues & Cyber Law.

Text Books:

1. E Balagurusamy , “Fundamentals of Computers ”,TMH 2009.
2. Silakari and Shukla, “Basic Computer Engineering ”, Wiley India 2011.
3. V. Rajaraman, Neeharika Adabala, “Fundamentals of Computers”, Sixth edition PHI 2015
4. Ajoy Kumar Ray and Tinku Acharya ,“ Basic Computer Engineering”, PHI 2011.
5. P K Sinha ,“Fundamentals of Computers ” ,Fourth , BPB Publications, 2004. Reference

Books:

1. J. P. Tremblay and R.B. Bunt, “An Introduction of Computer Science –An Algorithmic Approach”,TMH 2015.
2. Faith Wempen , "Computing Fundamentals: Introduction to Computers ", Wiley 2015.
3. Norton, Peter, “Introduction to Computers”, Fourth revised ,Mc-Graw-Hill 2000.
4. Reema Thareja , “Fundamental of Computers”, Oxford University Press, 2014.

List of Practical:

1. Study and Perform different MS –DOS Commands (Internal and External).
2. Create the "test" directory in the directory you are currently in using MS-DOS.
3. Study of Word – Templates, Styles.
4. Create a new user and give it Administrator privilege for Microsoft windows OS.
5. Create a MS-Word .doc file contain your complete CV.
6. Study and perform different Excel Commands/Functions.
7. Perform MS-Excel Accounting.
8. Create a MS-Excel .xls file contain mark sheet.
9. Display the student's result into a chart using MS-Excel.
10. Create a MS-Power Point Presentation .ppt file covers the topic “Computer's Evolution”.
11. Create a MS-Power Point Presentation .ppt file covers the topic “social responsibility”.
12. Create a MS-Access database .mdb file to store the results of students.
13. Study of various Network topologies.

S.6 Digital Logic and Circuit Design(BTEC-104)

UNIT I Number System & Codes:

Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1’s Complement & 2 ’s Complement representation and their arithmetic operation, Floating point representation, binary codes, BCD,ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II Boolean algebra and Logic gates:

Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan’s theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / Quine McCluskey method.

UNIT III Combinational logic:

Arithmetic circuits- Half adder, Full adder, Halfsubtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

UNIT IV Sequential logic:

Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V Semiconductor Memories and A/D and D/A converters:

Semiconductor Memory – RAM, ROM Organization, operation and their Types, PLD-PAL, PLA, PROM, FPGA, Analog to Digital (A/D)and Digital to Analog (D/A) converters and their types

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. S Salivahanan and S Arivazhagan: Digital Circuits and Design, 4th Edition, Vikas Publishing House, 2012.

Reference Books:

- A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI, 2016.
1. Floyd and Jain, "Digital Fundamentals", 10th Edition, Pearson Education India, 2011.
2. Roland J.Tocci, Widmer, Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson 2009.
8. Stephen Brown, ZvankoVranesic, "Fundamentals of Digital Logic Design", 3rd Edition, McGraw Hill, 2017.

List of Practical:

1. To study and test of operation of all logic gates for various IC's (IC7400, IC7403, IC408, IC74332, IC7486).
2. Verification of DeMorgan's theorem.
3. To construct of half adder and full adder.
4. To construct of half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Design a BCD to excess 3code converter.
8. Design a Multiplexer/ Demultiplexer
9. Analysis of various flip flops with Preset and Clear capability.
10. Design of Johnson and Ring counter.
11. Design of synchronous and asynchronous up/down counters.

UNIT I Introduction to Programming Languages:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals Of Algorithms, Flowcharts.

UNIT II Introduction to 'C' Language:

Character Set.Variables and Identifiers, Built-In Data Types. Variable Definition, Arithmetic Operators and Expressions, Constants And Literals, Simple Assignment Statement, Basic Input/Output Statement, Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement, Structured Programming.

UNIT III One Dimensional Arrays:

Array Manipulation; Searching, Insertion, Deletion of an Element from an Array; Finding the Largest/Smallest Element in an Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of a Square Matrix, Strings as Array of Characters, Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions And Pointers, Arrays And Pointers, Pointer Arrays.

UNIT IV Top-Down Approach of Problem Solving:

Modular Programming and Functions, Standard Library of C Functions, Prototype of a Function: Formal Parameter List, Return Type, Function Call, Block Structure, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions and Arrays as Function Arguments Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

UNIT V Concept of Files:

File Opening in Various Modes and Closing of a File, Reading from a File, Writing onto a File.

Text Books:

1. Tennence W.Pratt, “Programming languages design and implementation”, Prentice Hall of India.
2. Allen B. Tucker, “Programming Languages”, Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH publications.
4. Balagurusamy,:”Programming with C++”, ANSI C TMH

Reference Books:

1. Roosta- Foundation of Programming Languages,Vikas
2. Jeyapoovan- A First Course in Prog with C, Vikas 8. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
3. Fundamentals of Programming Languages, R. Bangia,Cyber Tech .

4. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB

- Sem 2

S.1 Communication Skills (HUCS-101)

UNIT I Communication:

Nature, Meaning, Definition, Verbal and Non Verbal Communication Barriers to Communication.

UNIT II Basic Language Skills:

Grammar and usage- Parts of Speech, Tenses, S-V Agreement, Preposition, Article.

UNIT III Basic Language Skills:

Types of Sentence, Direct - Indirect, Active - Passive voice, Phrases& Clauses. UNIT IV Business Correspondence: Business Letter, Parts & Layouts of Business Resume and Job application, E-mail writing.

UNIT V Report Writing:

Importance of Report, Types of Report, Structure of a Report.

Text & Reference Books:

1. Ashraf Rizvi.(2005).Effective Technical Communication. New Delhi: Tata McGrawHill
2. Adair, John (2003). Effective Communication. London: Pan Macmillan Ltd.
3. A.J.Thomson and A.V.Martinet(1991).A Practical English Grammar(4th ed). New York: Oxford IBH Pub.
4. Kratz, Abby Robinson (1995). Effective Listening Skills. Toronto: ON: Irwin Professional Publishing.
5. Prasad, H. M.(2001) How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill.
6. Pease, Allan. (1998). Body Language. Delhi: Sudha Publications.

List of Practical:

1. Self-Introduction
2. Reading Skills and Listening Skills
3. Oral Presentation
4. Linguistics and Phonetics
5. JAM (Just a Minute)
6. Group Discussion

S.2 Programming Skills with 'C++' (BTCS-208)

UNIT I:

Object Oriented Programming: Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies.

UNIT II: Tokens, Expression and controls Structures:

Tokens , Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables. Operators in C++ : Scope resolution operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. Functions: The main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III: Class and Object:

Introduction, Specifying a Class, Defining Member Functions, C++ Program with Class, Nesting of Member functions, Private Member Functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructor and Destructor: Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, and Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor, Operator overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators.

UNIT IV: Inheritance and Polymorphisms:

Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT V: I/O Operations and Files:

C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put(), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good().

Text Books:

1. E Balagurusamy, Object Oriented Programming with C++, 7Th Edition, Mc Graw Hill India, 2017.
2. Robert Lafore, Object Oriented Programming In C++, 4Th Edition, 2001.
3. David Parsons, Object Oriented Programming with C++; BPB publication, 2008.
4. Hubbard, Programming in C++ (Schaum), 3rd Edition, McGraw Hill Education, 2009.

Reference Books:

1. Herbert Schildt, The Complete Reference, 4th Edition, Tata McGraw-Hill Education Pvt. Ltd.,2000.
2. K R Venugopal, Mastering C++, 2nd Edition, McGraw Hill Education, 2017.
3. Rajaram, R., Object Oriented Programming and C++, Second Edition, 2007
4. Saurav Sahay, Object Oriented Programming with C++, Oxford, 2006.

List of Practical:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76
2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.
3. Write a function using reference variables as arguments to swap the values of a pair of integers.
4. Write a macro that obtains the largest of 3 numbers.

5. Define a class to represent a bank account. Include the following members:

Data members

1. Name of the depositor
2. Account number
3. Type of account
4. Balance amount in the account

Member functions

1. To assign initial values
2. To deposit an amount
3. To withdraw an amount after checking the balance
4. To display name and balance

Write a main program to test the program.

7. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and odd one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

7. Design a constructor for bank account class.

8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message “Required copies not in stock” is displayed.

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.

9. Improve the system design in exercise 8 to incorporate the following features:

(a) The price of the books should be updated as and when required. Use a private member function to implement this.

(b) The stock value of each book should be automatically updated as soon as a transaction is completed.

(c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.

10. Design a C++ Class „Complex“ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

11. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class account that stores customer name, account number and type of account. From this derive the classes curacct and savacct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

a) Accept deposit from a costumer and update the balance.

b) Display the balance

c) Compute and deposit interest.

d) Permit withdrawal and update the balance.

e) Check for the minimum balance, impose penalty, necessary and update balance.

12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it the derived class to suit their requirements.

S.3 Object Oriented Programming (BTCS-305)

UNIT-I Introduction to OOP:

Abstract data types, Objects and classes, Attributes and Methods, Objects as software units, Encapsulation and Information hiding, Objects instantiations and interactions, Object lifetime, Static and dynamic objects, global and local objects, Metaclasses, Modeling the real world objects.

UNIT-II Object and Classes:

Relationships between classes, Association of objects, Types of Association, Recursive Association, Multiplicities, Navigability, Named association, Aggregation of objects. Types of Aggregation, Delegation, Modeling Association and Aggregation.

UNIT-III OOP Concepts :

Inheritance and Polymorphism, Types of Polymorphism, Static and Dynamic Polymorphism, Operator And Method Overloading, Inherited Methods, Redefined Methods, The Protected Interface, Abstract Methods and Classes, Public and Protected Properties, Private Operations, Multiple Inheritance.

UNIT-IV I/O and File management:

Concept of Streams, Cin and Cout Objects, C++ Stream Classes, Unformatted and Formatted I/O, Manipulators, File Stream, C++ File Stream Classes, File Management Functions, File Modes, Binary And Random Files.

UNIT-V C++/Java:

Exception Handling , TypeCasting ,Templates function and class in C++, Comparison Between C++ and Java, Features of Java ,Introduction to java, Inheritance, Interface and Abstract class in Java.

TEXT BOOKS:

1. David Parsons; Object oriented programming with C++; Second edition; BPB publication; 1997.
2. Robert Lafore; Object oriented programming in C++ ; Fourth edition ; Pearson publication;2002 .
3. E Balagurusamy; Object oriented programming with C++; Seven edition; TMH; 2017.
4. Herbert Schildt ; Java Complete Reference;Seven edition; McGrawHill; 2006 .

REFERENCES:

- 1.John R Hubbard; Programming in C++ (Schaum); Third edition; TMH; 2000.
- 2.Venugopal; Mastering C++ ; second edition ;TMH; 2006.
- 3.Steven Holzner; C++ Programming Black Book; First Edition; Coriolis Group,U.S;2001.
- 4.E Balagurusamy; Programming with java a primer; Fourth edition; TMH ; 2011.

S.4 Computer System Organization (BTCS-404)

UNIT 1 Introduction for basic model of computer:

Brief History of computers, Von Newman architecture, Computer components, CPU, Memory, I/O, System Bus, registers, Program Counter, Accumulator, Register Transfer Language, Instruction Cycle, Instruction formats and addressing modes of basic computer. Basic arithmetic operations: addition, subtraction, multiplication, division, floating point arithmetic.

UNIT II Control Unit Organization:

Control unit operations - Address Sequencing & Micro operations, Hardwired control unit, Micro and Nano programmed control unit, Control Memory, Micro Instruction formats, Micro program sequencer, Microporogramming.

UNIT III Input Output Organization:

I/O Systems, Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, I/O processor, Introduction to 8085, 8085 I/O structure, 8085 instruction set and basic programming.

UNIT IV Memory organization:

Characteristics of Memory systems, Internal and External memories, Memory Hierarchy, High speed Memories: Cache Memory - Organization and mappings, Associative memory, Virtual memory: Segmentation, Paging, Address Translation Virtual to Physical. Secondary Storage: Magnetic Disk, Tape, DAT, RAID, Optical memory, CDROM, DVD.

UNIT V Multiprocessors:

Multiprocessor organization, Instruction level pipelining and Superscalar Processors , Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication, GPU.

Text Books:

- 1.Morris Mano, Computer System Architecture, Fourth edition, PHI, 2015.
- 2.Tanenbaum, Structured Computer Organization, First Edition, Pearson Education, 2016.
- 3.J P Hayes, Computer Architecture and Organizations, Third edition, Mc- Graw Hills, New Delhi, 2017

Reference Books:

- 1.Gaonkar, Microprocessor Architecture, Programming, Applications with 8085, fifth Edition, Prentice Hall, 2015.
- 2.William Stallings, Computer Organization and Architecture, Seventh Edition, PHI, 2009.
- 3.ISRD group, Computer Organization, Second edition, TMH, 2006.
- 4.Carter, Computer Architecture (Schaum), Third Edition, TMH, 2012.
- 5.Carl Hamacher, Computer Organization, Fifth Edition, TMH, 2002.

S.5 Data Structure and Algorithms (BTCS-403)

UNIT I Introduction:

Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations. Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays. Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

UNIT II Linked List:

Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list

Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

UNIT III Stack:

The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi. The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV Tree:

Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion. Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V Sortings:

Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

Text books:

1. Ashok N. Kamthane, "Introduction to Data structures", 2nd Edition, Pearson Education India,2011.
2. Tremblay & Sorenson, "Introduction to Data- Structure with applications", 8th Edition, Tata McGrawHill,2011.
3. Bhagat Singh & Thomas Naps, "Introduction to Data structure", 2nd Edition, Tata McGrawHill 2009.
4. Robert Kruse, "Data Structures and Program Design",2nd Edition,PHI,1997.
5. Lipschutz Seymour,"Data structures with C" ,1st Edition ,Mc- GrawHill,2017.

Reference Books:

1. Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.
2. ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.
3. E. Balagurusamy ,”Data Structure Using C” ,Tata McGraw-Hill 2017.
4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015
5. Gav Pai, Data Structures, Tata McGraw-Hill, 2015.

List of Practical:

1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.
3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list
10. Program for implementation of Bubble sort
11. Program for Insertion sort
12. Program for Merge Sort
13. Program to implement Heap sort
14. Program to implement Quick sort
15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. To develop an algorithm for binary tree operations and implement the same.
17. To design an algorithm for sequential search, implement and test it.
18. To develop an algorithm for binary search and perform the same.

S.6 Mathematics-II (BTMACS-201)

UNIT I Calculus of Matrices:

Systems of linear equations and their solutions. Matrices, determinants, rank and inverse. Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices.

UNIT II Differential Equation:

Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

UNIT III Numerical Analysis Interpolation and Curve Fitting:

Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton-Gregory Polynomial Form; Lagrange Polynomial Interpolation; Approximation by Least Square Method. Numerical Differentiation and Integration: Discrete Approximation of Derivatives: Forward and Backward Difference Forms, Numerical Integration, Simple Newton-Cotes Rules: Trapezoidal and Simpson's (1/3) Rules; Weddle's Rule.

UNIT IV Numerical Solution of ODE:

Euler's Method for Numerical Solution of ODE; Modified Euler's Method; Runge-Kutta Method (RK2, RK4); Multistep Method: Predictor-Corrector method.

UNIT V Probability Theory and Random Process:

Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, Poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains.

Text Books:

1. G. Strang, Linear Algebra And Its Applications, 4th Edition, Brooks/Cole, 2006
2. S. L. Ross, Differential Equations, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 7th Edition, Wiley, 2001.
5. K. E. Atkinson, Numerical Analysis, John Wiley, Low Price Edition (2004).
6. S. D. Conte and C. de Boor, Elementary Numerical Analysis - An Algorithmic Approach, McGraw-Hill, 2005.
7. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley, 2005.
2. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley, 1999.
3. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
4. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.
5. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, 2001.
6. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
7. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw-Hill 2008.

S.7 Computer Peripherals and Interfaces (BTCS-204)

UNIT I Memory:

Introduction to memory and its use, Memory chips and Modules: DIPP, SIPP, SIMM, DIMM, SO-DIMM, RIMM, Parity checking and ECC, ROM and its types, RAM and its types, Trouble shooting of Memory, Advanced Memory technologies: RDRAM, DDRAM, PRAM, VRAM.

UNIT II Motherboard:

Motherboard Controllers and System Resources, I/O System Bus: ISA, MCA, ELSA, VESA local bus, PCI, AGP, PCIX, Onboard I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS settings, Motherboard Form factor: AT and ATX Motherboard, LPX and NLX form factor.

UNIT III Power Supply:

Power Supply Functions and Operations, Power Supply Quality and Specifications, Power Supply and Form factors, Ventilation and Cooling: Fan, Processor cooling, Temperature limits, Power Problems and procedures, Power protection devices, Back-up power system.

UNIT IV Interfaces and I/O Ports:

Floppy Disk interface: Controller, Power cable, Control/Data cable, IDE interfaces: ATA standards, Master/Slave Configuration, Data transfer modes, SCSI interface: Bus, Standards, Hardware's, which is better SCSI or IDE, Serial ports, Parallel ports, USB, Troubleshooting.

UNIT V Device Drives and Peripherals:

Magnetic Storage: Reading/Writing, hard disk drives, Floppy disk drives, Optical Storage devices: CD-ROM drive, DVD-ROM drive, Keyboard: layouts, interfaces, Pointing devices, Mouse, Monitors, Printers, Troubleshooting of device drivers and peripherals.

Text Books:

- 1.Craig Zacker& John Rourtre, PC Hardware- The complete reference,First Edition, TMH, 2017**
- 2.S.K. Chauhan, PC Upgrading, maintenance and troubleshooting guide, First Edition,**
- 3. B. Govindarajalu, IBM PC and CLONES: Hardware, Troubleshooting and Maintenance McGraw Hill Education, 2nd Edition 2002**
- 4.Mark Minasi, The Complete PC Upgrade and Maintenance Guide, Sixteenth edition Wiley, 2005**
- 5.Mike Meyers, Introduction to PC Hardware and Troubleshooting, 1st edition, McGraw Hill Education, 2017**

Reference Books:

- 1. Stephen Bigelow, Bigelow's Troubleshooting, Maintaining & Repairing PCs, 5 edition, McGraw Hill Education, 2017**
- 2. Manahar Lotia, Pradeep Nair, Payal Lotia, Modern Computer Hardware Course, Second Revised Edition, BPB Publications, 2007**
- 3. Vikas Gupta, Comdex Hardware and Networking Course Kit: Revised & Upgraded, Dreamtech Press, 2014**
- 4. Dan Gookin, Troubleshooting and Maintaining Your PC All-in-One For Dummies, 3rd edition, John Wiley & Sons, 2017**
- 5. Robert Bruce Thompson, Barbara Fritchman Thompson, Building the Perfect PC, 3 edition, O'Reilly, 2010**

List of Practical:

- 1. To study and demonstrate the motherboard.**

2. To study microprocessor and its types.
3. To study Back Power Supply: SMPS and UPS.
4. To study the Optical Drives: CD-ROM and DVD-ROM.
5. To study the working principle of keyboard and mouse.
6. To study different types ports and slots on board.
7. To study various types of Cables and their Connectors.
8. To study the working principle of monitor.
9. To study different types of printers.
10. To study the process of assembling a Motherboard.
11. To study working of Floppy Disk Drive.

- **Department of Information Technology**

- Program
 - 1) B.tech (IT)

- Sem 1

S.1 Web Development Lab-I(HTML & XML) (BTIT-307)

UNIT I Introduction to HTML:

What is HTML, HTML Documents, SGML, Basic structure of an HTML document, creating an HTML document, Headers tags, Body tags, Paragraphs formatting, Text Elements, Tag Elements, Special Character elements, Image tags, HTML Table tags and lists: Numbered list, Non- Numbered lists, Definition lists, Anchor tag, Name tag, Hyperlinks – FTP/HTTP/HTTPS, Links with images and buttons, Links to send email messages, Text fonts and styles, background colors/images, Marquee Behavior, Forms related tags. (Action, method, name, inputetc.)

UNIT II HTML5:

Introduction of HTML5, Browser supports, Migration from HTML4 to HTML5, New Elements in HTML5, HTML5 different parts layout of a web page, HTML5 Graphics: Canvas, SVG, HTML Media Tags: Inserting audio files, Inserting video files, Screen control attributes, Media control attributes, HTML Object.

UNIT III CSS:

Introduction of CSS, CSS Syntax CSS Id & Class. CSS Styling: styling Backgrounds, styling Text, styling Fonts, styling Links, styling Lists, styling Tables. CSS Box Model: Border, Outline, Margin, Padding. CSS Advanced: Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image capacity, Image Sprites, Media Types, and Attribute Selectors.

UNIT IV XML:

Introduction of XML, Cross scripting of XML, XML as intermediate language, Difference between XML and HTML, XML DOM, Tree, Syntax, Elements, Attributes, Namespaces, XPath,

XML DTD, Applications, XQuery, XML Schema, XML Parser, XHTML: Introduction of XHTML, XHTML rules over the HTML, conversation HTML to XHTML.

UNIT V Java Script:

Introduction to client side scripting, Server side scripting, Java Script Syntax, Variables and Functions, Operators: JavaScript Arithmetic Operators, JavaScript Assignment Operators, JavaScript Popup Boxes, JavaScript Window, Events and Objects, JavaScript Function Call, Validation in webpages, Introduction of AJAX

Text Books:

1. Jennifer Niederst Robbins. Learning Web Design, Fifth Edition, O'Reilly Media, Inc, May 2018.
2. Frain and Ben. Responsive Web Design with HTML5 and CSS3, Second Edition, 2015.
3. Nicholas c.Zakas. Java Script for Web Developers, Third edition, 2012.
4. George Q. Huang, K. L Mak. Internet Applications in Product Design and Manufacturing, ISBN: 3540434658, 2003 edition, springer, 2012.

Reference Books:

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible", Fifth Edition, WileyIndia, 2010.
2. John Duckett,"Beginning HTML, XHTML, CSS, and JavaScript ",WileyIndia, 2010.
3. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design",3rd edition, Wiley India, 2011.
4. Achyut S. Godbole, Atul Kahate, Web Technologies, ISBN: 9781259062681,3rd edition, TMH, 2013.

List of Practical:

1. Design a Web Page, Insert an image on to the web page such that image is of height 300 and width 300 pixels. The image should have an ALT text in it.
2. Create a Web page that holds a bulleted list of the names of your friends. Make sure that the bullets are in plain circle.
3. Create a Frame which would hold both the web page that was created earlier. The frame should be split row-wise into equal halves.
4. Create a Web Page to display the marks you got in all subjects of last semester using table.
5. Create a Form having two boxes with labels as First Name and Last Name. The User should not be allowed to enter the names directly in the text boxes. The input has to be given in the prompt box and then entered values should be given in the textboxes.
6. Create a Web Page that has a button in the center of the page. Using mouse events change the Message in the statusbar.
7. Design a Web page that accepts Username and Password. Opens a new window when the password corresponds to a particular value is set by the developer
8. Design a Web page that consists of 2 text boxes. When the page is first loaded set the focus to the first textbox. The user should not be allowed to leave the box unless enters a value in it.
9. To convert the HTML code to XHTML code.
10. To study the XML tree.

11. To study of Dreamweaver Tool.
12. To study of a Flash Animation Tool.

S.2 Programming Skills with 'C' (BTCS-108)

Unit - 1 Introduction to Programming:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals of Algorithms, Flow Charts.

UNIT II Programming using C:

C data types, int, char, float etc, C Expressions, Arithmetic Operation, Relational and Logic Operations, C Assignment Statements, Extension of Assignment of The Operations, C Primitive Input Output Using getchar and putchar, Exposure to the scanf and printf functions, C Statements, conditional executing using if, else, Optionally Switch and Break Statements may be mentioned.

UNIT III Iterations and Subprograms:

Concept of loops, Example of Loops in C Using for, while and do-while, Optionally continue may be mentioned, One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations, Concept of Sub-programming, functions Example of functions, Argument passing mainly for the simple variables.

UNIT IV Pointers and Strings:

Pointers, Relationship Between Arrays and Pointers Argument passing using Pointers Array of Pointers, Passing arrays as Arguments, Strings and C String Library. Structure and Unions, Defining C structures, Passing Strings as Arguments Programming Examples.

Unit –V File handling:

Console Input Output Functions, Disk Input Output Functions, Data files, Command Line Arguments, Bitwise Operators, Enumerated Data Types, Type Casting, macros, The C Preprocessor, More About library Functions.

Reference Books:

1. E Balaguruswamy , Object Oriented Programming With C++ , 4th Edition , TMH, 2008
2. Brian W. Kernighan and Dennis M. Ritchie ,“The C Programming Language”, 2nd Edition, Prentice-Hall India, New Delhi, 2002
3. Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2000
4. H. Cooper and H. Mullish, Jaico Publishing House. “Spirit of C”, 4th Edition, Jaico Publishing House, 2006

List of Practical:

1. Write a program to produce ASCII equivalent of given number.

- 2. Write a program to find divisor or factorial of a given number.**
- 3. Write a program to evaluate the following algebraic expressions after reading necessary values from the user**
- I $(ax+b)/(ax-b)$
- II $(x^5+10x^4+8x^3+4x+2)$
- 4. Write a program to find sum of a geometric series.**
- 5. Write a program to cipher a string.**
- 6. Write a program to check whether a given string follows English capitalization rules.**
- 7. Write a program to find sum of the numerical series.**
- 8. Write a program to search whether a given substring exist in an input string or not and then delete this string from input string.**
- 9. Write a recursive program for tower of Hanoi problem**
- 10. The fibonacci sequence of numbers is 1,1,2,3,5,8..... Based on the recurrence relation**
- a. $F(n)=F(n-1)+F(n-2)$ for $n>2$**
 - b. Write a recursive program to print the first m Fibonacci number**
- 11. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices**
- a) Addition of two matrices**
 - b) Subtraction of two matrices**
 - c) Finding upper and lower triangular matrices**
 - d) Trace of a matrix**
 - e) Transpose of a matrix**
 - f) Check of matrix symmetry**
 - g) Product of two matrices.**
- 12. Write a program that takes two operands and one operator from the user perform the operation and then print the answer.**
- 13. Write a program to print pyramid.**
- 14. Write functions to add, subtract, multiply and divide two complex numbers $(x+iy)$ and $(a+ib)$ Also write the main program.**
- 15. Write a program to copy one file to other, use command line arguments.**
- 16. Write a program to mask some bit of a number (using bit operations).**
- 17. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.**

S.3 Principles of 'C' language (BTCS-104)

UNIT I Introduction to Programming Languages:

Evolution of Programming Languages, Structured Programming, The Compilation Process, Object Code, Source Code, Executable Code, Operating Systems, Interpreters, Linkers, Loaders, Fundamentals Of Algorithms, Flowcharts.

UNIT II Introduction to 'C' Language:

Character Set. Variables and Identifiers, Built-In Data Types. Variable Definition, Arithmetic Operators and Expressions, Constants And Literals, Simple Assignment Statement, Basic Input/Output Statement, Decision Making Within A Program, Conditions, Relational Operators, Logical Connectives, If Statement, If-Else Statement, Loops: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Switch Statement, Structured Programming.

UNIT III One Dimensional Arrays:

Array Manipulation; Searching, Insertion, Deletion of an Element from an Array; Finding the Largest/Smallest Element in an Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of a Square Matrix, Strings as Array of Characters, Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions And Pointers, Arrays And Pointers, Pointer Arrays.

UNIT IV Top-Down Approach of Problem Solving:

Modular Programming and Functions, Standard Library of C Functions, Prototype of a Function: Formal Parameter List, Return Type, Function Call, Block Structure, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions and Arrays as Function Arguments, Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

UNIT V Concept of Files:

File Opening in Various Modes and Closing of a File, Reading from a File, Writing onto a File.

Text Books:

1. Tenncence W.Pratt, “Programming languages design and implementation”, Prentice Hall of India.
2. Allen B. Tucker, “Programming Languages”, Tata McGraw Hill.
3. Gottfried BS – Programming with C, TMH publications.
4. Balagurusamy,:”Programming with C++”, ANSI C TMH

Reference Books:

1. Roosta- Foundation of Programming Languages,Vikas
2. Jeyapoovan- A First Course in Prog with C, Vikas 8. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
3. Fundamentals of Programming Languages, R. Bangia,Cyber Tech .
4. Kanetkar, Yashvant – Understanding Pointers in C- 2nd Edn. BPB

S.4 Digital Logic and Circuit Design(BTEC-104)

UNIT I Number System & Codes:

Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1's Complement & 2 's Complement representation and their arithmetic operation, Floating point representation, binary codes, BCD,ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II Boolean algebra and Logic gates:

Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan's theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / Quine McCluskey method.

UNIT III Combinational logic:

Arithmetic circuits- Half adder, Full adder, Halfsubtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

UNIT IV Sequential logic:

Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V Semiconductor Memories and A/D and D/A converters:

Semiconductor Memory – RAM, ROM Organization, operation and their Types, PLD-PAL, PLA, PROM, FPGA, Analog to Digital (A/D)and Digital to Analog (D/A) converters and their types

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.
2. S Salivahanan and S Arivazhagan: Digital Circuits and Design, 4th Edition, Vikas Publishing House, 2012.

Reference Books:

- A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI, 2016.
1. Floyd and Jain, "Digital Fundamentals", 10th Edition, Pearson Education India, 2011.
2. Roland J.Tocci,Widmer,Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson 2009.
9. Stephen Brown, ZvankoVranesic, "Fundamentals of Digital Logic Design", 3rd Edition, McGraw Hill, 2017.

List of Practical:

1. To study and test of operation of all logic gates for various IC's (IC7400,IC7403,IC408,IC74332,IC7486).
2. Verification of DeMorgan's theorem.
3. To construct of half adder and full adder.
4. To construct of half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Design a BCD to excess 3code converter.
8. Design a Multiplexer/ Demultiplexer

9. Analysis of various flip flops with Preset and Clear capability.
10. Design of Johnson and Ring counter.
11. Design of synchronous and asynchronous up/down counters.

S.5 Introduction to Information Technology (BTIT-101)

UNIT I Data and Information:

Introduction, Type of Data, Simple model of Computer, Organization of CPU, Register, Bus Architecture, Instruction Set, Memory & Storage Systems, I/O Devices, and System & Application Software. Introduction to Operating System: Function, Types, Management of File, Process & Memory.

UNIT II Introduction to Database Management System:

Introduction, File Oriented Approach and Database Approach, Data Models, Architecture of Database System, Introduction and Working of Internet, Introduction to Network Protocol and Topologies. Types of Network: ISO-OSI Model, Functions of Different Layers. Internet Working Concepts, Devices, TCP/IP Model, LAN, WAN, Web Browser.

UNIT III IT Application in Communication:

Introduction to Cellular Mobile Systems, Cellular Mobile Telephone Systems, A Basic Cellular System, Operation of Cellular Systems. Network Services Telephone Services, Radio and TV Broadcasting, Audio-Visual Conferencing, Video-onDemand.

UNIT IV IT Applications in Multimedia:

Introduction, Components of Multimedia and Challenges, Video Compression, Video Coding Technology: JPEG, MPEG, and JBIG. Introduction to Cloud Computing: Types, Services, Models, Characteristics, Benefits and Challenges, Application, Limitations.

UNIT V IT Application in E-Commerce and E-Governance:

Introduction, Different Types of ECommerce with Examples, Advantages and Disadvantages, E-Commerce in India, E-Services, E-Commerce Security, Internet Security and Ethics, Technology Issues, Social Issues, Introduction to E-Governance, Challenges, Application, Advantages, Case Study of MP-online and IRCTC.

Text Books:

1. Fundamentals of Computers: E Balagurusamy, TMH
2. Information Technology Principles and Application: Ajoy Kumar Ray & Tinku Acharya PHI.

Reference Books:

1. V.Rajaraman, Introduction to Information Technology; PHI
2. Santiram Kal Basic Electronics, PHI
3. M.N. Rao Cloud Computing, PHI

- 4. Computer Networks:** Andrew Tananbaum, PHI
- 5. Data Base Management Systems,** Korth, TMH
- 6. William Cy Lee , Mobile Cellular Telecommunications, 2nd Edition,** MC Graw Hill.

List of Practical:

- 1. To study about the Generation of the Computer.**
- 2. To study about MS-DOS Internal & External Commands.**
- 3. To study about the Installation process of Windows Operating System.**
- 4. To study about Widows related operation: Control Panel, Device Manager.**
- 5. Creation and editing of text files using MS-Word.**
- 6. Creation and operating of spreadsheet using MS -Excel.**
- 7. Creation and editing power - point slides using MS -Power Point.**
- 8. To study about MP-Online website and create report on it.**
- 9. To study about IRCTC website and create report on it.**
- 10. To study about NPTEL website and create report on.**

S.6 Computer Peripherals and Interfaces (BTCS-204)

UNIT I Memory:

Introduction to memory and its use, Memory chips and Modules: DIPP, SIPP, SIMM, DIMM, SO-DIMM, RIMM, Parity checking and ECC, ROM and its types, RAM and its types, Trouble shooting of Memory, Advanced Memory technologies: RDRAM, DDRAM, PRAM, VRAM.

UNIT II Motherboard:

Motherboard Controllers and System Resources, I/O System Bus: ISA, MCA, ELSA, VESA local bus, PCI, AGP, PCIX, Onboard I/O devices, Chipsets, ROM BIOS, ROM POST, CMOS settings, Motherboard Form factor: AT and ATX Motherboard, LPX and NLX form factor.

UNIT III Power Supply:

Power Supply Functions and Operations, Power Supply Quality and Specifications, Power Supply and Form factors, Ventilation and Cooling: Fan, Processor cooling, Temperature limits, Power Problems and procedures, Power protection devices, Back-up power system.

UNIT IV Interfaces and I/O Ports:

Floppy Disk interface: Controller, Power cable, Control/Data cable, IDE interfaces: ATA standards, Master/Slave Configuration, Data transfer modes, SCSI interface: Bus, Standards, Hardware's, which is better SCSI or IDE, Serial ports, Parallel ports, USB, Troubleshooting.

UNIT V Device Drives and Peripherals:

Magnetic Storage: Reading/Writing, hard disk drives, Floppy disk drives, Optical Storage devices: CD-ROM drive, DVD-ROM drive, Keyboard: layouts, interfaces, Pointing devices, Mouse, Monitors, Printers, Troubleshooting of device drivers and peripherals.

Text Books:

- 1.Craig Zacker& John Rourtre, PC Hardware- The complete reference,First Edition, TMH, 2017
- 2.S.K. Chauhan, PC Upgrading, maintenance and troubleshooting guide, First Edition,
3. B. Govindarajalu, IBM PC and CLONES: Hardware, Troubleshooting and Maintenance McGraw Hill Education, 2nd Edition 2002
- 4.Mark Minasi, The Complete PC Upgrade and Maintenance Guide, Sixteenth edition Wiley, 2005
- 5.Mike Meyers, Introduction to PC Hardware and Troubleshooting, 1st edition, McGraw Hill Education, 2017

Reference Books:

1. Stephen Bigelow, Bigelow's Troubleshooting, Maintaining & Repairing PCs, 5 edition, McGraw Hill Education, 2017
2. Manahar Lotia, Pradeep Nair, Payal Lotia, Modern Computer Hardware Course, Second Revised Edition, BPB Publications, 2007
3. Vikas Gupta, Comdex Hardware and Networking Course Kit: Revised & Upgraded, Dreamtech Press, 2014
4. Dan Gookin, Troubleshooting and Maintaining Your PC All-in-One For Dummies, 3rd edition, John Wiley & Sons, 2017
5. Robert Bruce Thompson, Barbara Fritchman Thompson, Building the Perfect PC, 3 edition, O'Reilly, 2010

List of Practical:

1. To study and demonstrate the motherboard.
2. To study microprocessor and its types.
3. To study Back Power Supply: SMPS and UPS.
4. To study the Optical Drives: CD-ROM and DVD-ROM.
5. To study the working principle of keyboard and mouse.
6. To study different types ports and slots on board.
7. To study various types of Cables and their Connectors.
8. To study the working principle of monitor.
9. To study different types of printers.
10. To study the process of assembling a Motherboard.
11. To study working of Floppy Disk Drive.

S.7 Mathematics – (BTMACS-101)

UNIT I Differential Calculus:

Limits of functions, continuous functions, uniform continuity, monotone and inverse functions. Differentiable functions, Rolle's theorem, mean value theorems and Taylor's theorem, power series. Functions of several variables, partial derivatives, chain rule, Tangent planes and normals. Maxima, minima, saddle points, Lagrange multipliers, exact differentials

UNIT II Integral Calculus:

Riemann integration, fundamental theorem of integral calculus, improper integrals. Application to length, area, volume, surface area of revolution. Multiple integrals with application to volume, surface area, Change of variables.

UNIT III Numerical Analysis:

Number Representation and Errors: Numerical Errors; Floating Point Representation; Finite Single and Double Precision Differences; Machine Epsilon; Significant Digits. Numerical Methods for Solving Nonlinear Equations: Method of Bisection, Secant Method, False Position, Newton-Raphson's Method, Multidimensional Newton's Method, Fixed Point Method and their convergence.

UNIT IV Numerical Methods for Solving System of Linear Equations:

Norms; Condition Numbers, Forward Gaussian Elimination and Backward Substitution; Gauss-Jordan Elimination; FGE with Partial Pivoting and Row Scaling; LU Decomposition; Iterative Methods: Jacobi, Gauss Siedal; Power method and QR method for Eigen Value and Eigenvector.

UNIT V Vector Calculus:

Gradient and directional derivative. Divergence and Curl of Vector point function, line and surface integrals. Green“s, Gauss“ and Stokes“ theorems and their applications.

Text Books:

31. T. M. Apostol, **Calculus, Volume I**, 2nd Ed, Wiley, 1967.
32. T. M. Apostol, **Calculus, Volume II**, 2nd Ed, Wiley, 1969.
33. K. E. Atkinson, **Numerical Analysis**, John Wiley, Low Price Edition(2004).
34. S. D. Conte and C. de Boor, **Elementary Numerical Analysis - An Algorithmic Approach**, McGraw-Hill, 2005.
35. B. S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers, Delhi

Reference Books:

37. R. G. Bartle and D. R. Sherbert, **Introduction to Real Analysis**, 5th Ed, Wiley, 1999.
38. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
39. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
40. J. D. Hoffman, **Numerical Methods for Engineers and Scientists**, McGraw-Hill, 2001.
41. M.K Jain, S.R.K Iyengar and R.K Jain, **Numerical methods for scientific and engineering computation (Fourth Edition)**, New Age International (P) Limited, New Delhi, 2004.
42. S. C. Chapra, **Applied Numerical Methods with MATLAB for Engineers and Scientists**, McGraw-Hill, 2008.

- Sem 2

S.1 Communication Skills (HUCS-101)

UNIT I Communication:

Nature, Meaning, Definition, Verbal and Non Verbal Communication Barriers to Communication.

UNIT II Basic Language Skills:

Grammar and usage- Parts of Speech, Tenses, S-V Agreement, Preposition, Article.

UNIT III Basic Language Skills:

Types of Sentence, Direct - Indirect, Active - Passive voice, Phrases& Clauses. UNIT IV Business Correspondence: Business Letter, Parts & Layouts of Business Resume and Job application, E-mail writing.

UNIT V Report Writing:

Importance of Report, Types of Report, Structure of a Report.

Text & Reference Books:

1. Ashraf Rizvi.(2005).Effective Technical Communication. New Delhi: Tata McGrawHill
2. Adair, John (2003). Effective Communication. London: Pan Macmillan Ltd.
3. A.J.Thomson and A.V.Martinet(1991).A Practical English Grammar(4thed). New York: Oxford IBH Pub.
4. Kratz, Abby Robinson (1995). Effective Listening Skills. Toronto: ON: Irwin Professional Publishing.
5. Prasad, H. M.(2001) How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill.
6. Pease, Allan. (1998). Body Language. Delhi: Sudha Publications.

List of Practical:

1. Self-Introduction
2. Reading Skills and Listening Skills
3. Oral Presentation
4. Linguistics and Phonetics
5. JAM (Just a Minute)
6. Group Discussion

S.2 Programming Skills with 'C++' (BTCS-208)

UNIT I:

Object Oriented Programming: Concept of Object Oriented Programming - Data hiding, Data encapsulation, Class and Object, Abstract class and Concrete class, Polymorphism (Implementation of polymorphism using Function overloading an example in C++); Inheritance, Advantages of Object Oriented Programming over earlier programming methodologies.

UNIT II: Tokens, Expression and controls Structures:

Tokens , Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables. Operators in C++ : Scope resolution operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type cast operators, Expressions and Control Structures. Functions: The main() function, Function Prototyping, Call by reference, Return by reference, Inline function, Function Overloading.

UNIT III: Class and Object:

Introduction, Specifying a Class, Defining Member Functions, C++ Program with Class, Nesting of Member functions, Private Member Functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects. Constructor and Destructor: Constructor: Special Characteristics, Declaration and Definition of a constructor, Default Constructor, Overloaded Constructors, Copy Constructor, and Constructor with default arguments; Destructor: Special Characteristics, Declaration and definition of destructor, Operator overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators.

UNIT IV: Inheritance and Polymorphisms:

Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, Polymorphism, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT V: I/O Operations and Files:

C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers : seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations : put(), get(), write(), read() functions, Error handling File Operations : eof(), fail(), bad(), good().

Text Books:

1. E Balagurusamy, Object Oriented Programming with C++, 7Th Edition, Mc Graw Hill India, 2017.
2. Robert Lafore, Object Oriented Programming In C++, 4Th Edition, 2001.
3. David Parsons, Object Oriented Programming with C++; BPB publication, 2008.
4. Hubbard, Programming in C++ (Schaum), 3rd Edition, McGraw Hill Education, 2009.

Reference Books:

1. Herbert Schildt, **The Complete Reference**, 4th Edition, Tata McGraw-Hill Education Pvt. Ltd.,2000.
2. K R Venugopal, **Mastering C++**, 2nd Edition, McGraw Hill Education, 2017.
3. Rajaram, R., **Object Oriented Programming and C++**, Second Edition, 2007
4. Saurav Sahay, **Object Oriented Programming with C++**, Oxford, 2006.

List of Practical:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76
2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.
3. Write a function using reference variables as arguments to swap the values of a pair of integers.
4. Write a macro that obtains the largest of 3 numbers.
5. Define a class to represent a bank account. Include the following members:

Data members

1. Name of the depositor
2. Account number
3. Type of account
4. Balance amount in the account

Member functions

1. To assign initial values
2. To deposit an amount
3. To withdraw an amount after checking the balance
4. To display name and balance

Write a main program to test the program.

7. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

7. Design a constructor for bank account class.

8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message “Required copies not in stock” is displayed.

Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.

9. Improve the system design in exercise 8 to incorporate the following features:

(a) The price of the books should be updated as and when required. Use a private member function to implement this.

(b) The stock value of each book should be automatically updated as soon as a transaction is completed.

(c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.

10. Design a C++ Class „Complex“ with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

11. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class account that stores customer name, account number and type of account. From this derive the classes curacct and savacct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

- a) Accept deposit from a costumer and update the balance.**
- b) Display the balance**
- c) Compute and deposit interest.**
- d) Permit withdrawal and update the balance.**
- e) Check for the minimum balance, impose penalty, necessary and update balance.**

12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it the derived class to suit their requirements.

S.3 Object Oriented Programming (BTCS-305)

UNIT-I Introduction to OOP:

Abstract data types, Objects and classes, Attributes and Methods, Objects as software units, Encapsulation and Information hiding, Objects instantiations and interactions, Object lifetime, Static and dynamic objects, global and local objects, Metaclass, Modeling the real world objects.

UNIT-II Object and Classes:

Relationships between classes, Association of objects, Types of Association, Recursive Association, Multiplicities, Navigability, Named association, Aggregation of objects. Types of Aggregation, Delegation, Modeling Association and Aggregation.

UNIT-III OOP Concepts :

Inheritance and Polymorphism, Types of Polymorphism, Static and Dynamic Polymorphism, Operator And Method Overloading, Inherited Methods, Redefined Methods, The Protected Interface, Abstract Methods and Classes, Public and Protected Properties, Private Operations, Multiple Inheritance.

UNIT-IV I/O and File management:

Concept of Streams, Cin and Cout Objects, C++ Stream Classes, Unformatted and Formatted I/O, Manipulators, File Stream, C++ File Stream Classes, File Management Functions, File Modes, Binary And Random Files.

UNIT-V C++/Java:

Exception Handling , TypeCasting ,Templates function and class in C++, Comparison Between C++ and Java, Features of Java ,Introduction to java, Inheritance, Interface and Abstract class in Java.

TEXT BOOKS:

1. David Parsons; Object oriented programming with C++; Second edition; BPB publication; 1997.
2. Robert Lafore; Object oriented programming in C++ ; Fourth edition ; Pearson publication;2002 .
3. E Balagurusamy; Object oriented programming with C++; Seven edition; TMH; 2017.
4. Herbert Schildt ; Java Complete Reference;Seven edition; McGrawHill; 2006 .

REFERENCES:

- 1.John R Hubbard; Programming in C++ (Schaum); Third edition; TMH; 2000.
- 2.Venugopal; Mastering C++ ; second edition ;TMH; 2006.
- 3.Steven Holzner; C++ Programming Black Book; First Edition; Coriolis Group,U.S;2001.
- 4.E Balagurusamy; Programming with java a primer; Fourth edition; TMH ; 2011.

S.4 Computer System Organization (BTCS-404)

UNIT 1 Introduction for basic model of computer:

Brief History of computers, Von Newman architecture, Computer components, CPU, Memory, I/O, System Bus, registers, Program Counter, Accumulator, Register Transfer Language, Instruction Cycle, Instruction formats and addressing modes of basic computer. Basic arithmetic operations: addition, subtraction, multiplication, division, floating point arithmetic.

UNIT II Control Unit Organization:

Control unit operations - Address Sequencing & Micro operations, Hardwired control unit, Micro and Nano programmed control unit, Control Memory, Micro Instruction formats, Micro program sequencer, Microporogramming.

UNIT III Input Output Organization:

I/O Systems, Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, I/O processor, Introduction to 8085, 8085 I/O structure, 8085 instruction set and basic programming.

UNIT IV Memory organization:

Characteristics of Memory systems, Internal and External memories, Memory Hierarchy, High speed Memories: Cache Memory - Organization and mappings, Associative memory, Virtual memory: Segmentation, Paging, Address Translation Virtual to Physical. Secondary Storage: Magnetic Disk, Tape, DAT, RAID, Optical memory, CDROM, DVD.

UNIT V Multiprocessors:

Multiprocessor organization, Instruction level pipelining and Superscalar Processors , Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication, GPU.

Text Books:

- 1.Morris Mano, Computer System Architecture, Fourth edition, PHI, 2015.
- 2.Tanenbaum, Structured Computer Organization, First Edition, Pearson Education, 2016.
- 3.J P Hayes, Computer Architecture and Organizations, Third edition, Mc- Graw Hills, New Delhi, 2017

Reference Books:

- 1.Gaonkar, Microprocessor Architecture, Programming, Applications with 8085, fifth Edition, Prentice Hall, 2015.
- 2.William Stallings, Computer Organization and Architecture, Seventh Edition, PHI, 2009.
- 3.ISRD group, Computer Organization, Second edition, TMH, 2006.
- 4.Carter, Computer Architecture (Schaum), Third Edition, TMH, 2012.
- 5.Carl Hamacher, Computer Organization, Fifth Edition, TMH, 2002.

S.5 Data Structure and Algorithms (BTCS-403)

UNIT I Introduction:

Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations. Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays. Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

UNIT II Linked List:

Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

UNIT III Stack:

The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi. The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV Tree:

Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion. Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V Sortings:

Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

Text books:

- 1.Ashok N. Kamthane, “Introduction to Data structures”, 2nd Edition, Pearson Education India,2011.
2. Tremblay & Sorenson, “Introduction to Data- Structure with applications”, 8th Edition, Tata McGrawHill,2011.
3. Bhagat Singh & Thomas Naps, “Introduction to Data structure”, 2nd Edition, Tata McGrawHill 2009.
4. Robert Kruse, “Data Structures and Program Design”,2nd Edition,PHI,1997.
5. Lipschutz Seymour,”Data structures with C” ,1st Edition ,Mc- GrawHill,2017.

Reference Books:

1. Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.
2. ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.
3. E. Balagurusamy ,”Data Structure Using C” ,Tata McGraw-Hill 2017.
4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015
5. Gav Pai, Data Structures, Tata McGraw-Hill, 2015.

List of Practical:

1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.

3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list
10. Program for implementation of Bubble sort
11. Program for Insertion sort
12. Program for Merge Sort
13. Program to implement Heap sort
14. Program to implement Quick sort
15. Program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. To develop an algorithm for binary tree operations and implement the same.
17. To design an algorithm for sequential search, implement and test it.
18. To develop an algorithm for binary search and perform the same.

S.6 APPLIED PHYSICS(BTPH-101)

UNIT I Quantum Physics:

Introduction to Quantum hypothesis, Matter wave concept, Wave Group and Particle velocity and their relations, Uncertainty principle with elementary proof and applications to microscope and single slit, Compton Effect, Wave function and its physical significance. Development of time dependent and time independent Schrodinger wave equation, Applications of time independent Schrodinger wave equation.

UNIT II Solid State Physics:

Free electron model, Qualitative Analysis of Kronig Penney Model, effective mass, Fermi level for Intrinsic and Extrinsic semiconductors, P-N junction diode, Zener diode, Tunnel diode, Photodiode, Solar- cells, Hall Effect, Introduction to Superconductivity, Meissner effect, Type I & II Superconductors.

UNIT III Nuclear Physics:

Nuclear Structure & Properties Nuclear models: Liquid drop with semiempirical mass formula & shell model. Particle accelerators: Cyclotron, Synchrotron, Betatron. Counters and Detectors: Giger-Muller counters, Bainbridge Mass Spectrograph and Auston Mass Spectrograph.

UNIT IV Laser & Fiber Optics:

Stimulated and Spontaneous Emission, Einstein's A&B Coefficients, Population Inversion, Pumping, Techniques of Pumping, Optical Resonator, Properties and Applications of Laser, Ruby, Nd:YAG, He-Ne lasers. Introduction to Optical fibre, Acceptance angle and cone, Numerical Aperture, V- Number, Ray theory of propagation through optical fibre, Pulse dispersion , applications of optical fibre.

UNIT V Wave Optics:

Introduction to Interference, Fresnel's Bi-prism, Interference in Thin films, Newton's rings experiment, Michelson 's interferometer and its application, Introduction to Diffraction and its Types, Diffraction at single slit, double slit, resolving power, Rayleigh criterion, Resolving power of grating, Concept of polarized light, Double refraction, quarter and half wave plate, circularly & elliptically polarized light.

Text Books:

1. Engineering Physics by Dr. S. L. Gupta and Sanjeev Gupta, Dhanpat Rai Publication, New Delhi.
2. Engineering Physics by Navneet Gupta, DhanpatRai Publication, New Delhi.
3. Engineering Physics by H. J. Sawant, Technical Publications, Pune, Maharastra.
4. Engg Physics by M.N. Avdhanulu& P.G. Kshirsagar, S.Chand&Co.Edition (2010).
5. Fundamentals of Physics by Halliday, Wiley, India.

Reference Books:

1. Concepts of Modern Physics by Beiser, TMH, New Delhi.
2. Solid State Physics by Kittel,Wiley India.
3. Atomic and Nuclear physics by Brijlal and Subraminiyan.
4. LASERSs and Electro Optics by Christopher C. Davis, Cambridge Univ. Press (1996).
5. Optoelectronics an Introduction by J. Wilson &J.F.B.Hawkes, " Prentice-Hall II Edition.
6. LASER theory and applications by A. K. Ghatak&Tyagarajan, TMH (1984). 7. Optics by Ghatak, TMH.

List of Practical:

1. Measurement of radius of curvature "R" of convex lens by Newton"s ring experiment.
2. Measurement of Numerical aperture of fiber by LASER.
3. Determination of Energy band gap „Eg“ of Ge using Four Probe method.
4. Measurement of Frequency of A.C. mains by electrically maintained vibrating rod.
5. Measurement of Resolving Power of Telescope.
6. Measurement of “ λ ” of LASER light source using Diffraction Grating.
7. Determination of Planck"s constant by using photocell.
8. Determination of Energy band gap (Eg) using PN Junction Diode.
9. To determine the mass of cane sugar dissolved in water using half shade polarimeter.
10. To study forward and reverse characteristics of Zener diode.

UNIT I Calculus of Matrices:

Systems of linear equations and their solutions. Matrices, determinants, rank and inverse.
Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices.

UNIT II Differential Equation:

Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations. Operator method. Method of undetermined coefficients and variation of parameters.

UNIT III Numerical Analysis Interpolation and Curve Fitting:

Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton-Gregory Polynomial Form; Lagrange Polynomial Interpolation; Approximation by Least Square Method. Numerical Differentiation and Integration: Discrete Approximation of Derivatives: Forward and Backward Difference Forms, Numerical Integration, Simple Newton-Cotes Rules: Trapezoidal and Simpson's (1/3) Rules; Weddle's Rule.

UNIT IV Numerical Solution of ODE:

Euler's Method for Numerical Solution of ODE; Modified Euler's Method; Runge-Kutta Method (RK2, RK4); Multistep Method: Predictor-Corrector method.

UNIT V Probability Theory and Random Process:

Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, Poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains.

Text Books:

1. G. Strang, **Linear Algebra And Its Applications**, 4th Edition, Brooks/Cole, 2006
2. S. L. Ross, **Differential Equations**, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, **An Introduction to Ordinary Differential Equations**, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, **Elementary Differential Equations and Boundary Value Problems**, 7th Edition, Wiley, 2001.
5. K. E. Atkinson, **Numerical Analysis**, John Wiley, Low Price Edition (2004).
6. S. D. Conte and C. de Boor, **Elementary Numerical Analysis - An Algorithmic Approach**, McGraw-Hill, 2005.
7. B. S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers, Delhi

Reference Books:

1. E. Kreyszig, **Advanced Engineering Mathematics**, 9th Edition, Wiley, 2005.

2. R. G. Bartle and D. R. Sherbert, **Introduction to Real Analysis**, 5th Ed, Wiley, 1999.
3. J. Stewart, **Calculus: Early Transcendentals**, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
4. J. Stoer and R. Bulirsch, **Introduction to Numerical Analysis**, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.
5. J. D. Hoffman, **Numerical Methods for Engineers and Scientists**, McGraw-Hill, 2001.
6. M.K Jain, S.R.K Iyengar and R.K Jain, **Numerical methods for scientific and engineering computation** (Fourth Edition), New Age International (P) Limited, New Delhi, 2004.
7. S. C. Chapra, **Applied Numerical Methods with MATLAB for Engineers and Scientists**, McGraw-Hill 2008.

- Sem 3

S.1 Web Development Lab-II (PHP/JSP) (BTIT-407)

UNIT-I Introduction to PHP:

Identify Relationship Between Apache, Mysql and PHP, Steps to Install and Test Web Server, Configure Apache to Use PHP, Create Simple PHP Page Using PHP Structure and Syntax, Use of PHP Variables, Data Types and PHP Operators, Apply Control Structures in Programming, Steps to Create User Defined Functions.

UNIT-II Working with in Built Functions:

Apply Various Inbuiltvariable(Gettype, Settype, Isset, Strval, Floatval, Intval, Print_R), String(Chr, Ord, Strtolower, Strtoupper, Strlen, Ltrim, Rtrim, Trim, Substr, Stremp, Strcasecmp, Crops, Strops, Stristr, Str_Replace, Strrev, Echo, Print), Math(Abs, Ceil, Floor, Round, Fmod, Min, Max, Pow, Sqrt, Rand), Date (Date, Getdate, Setdate, Checkdate, Time, Mktime), Array(Count, List, In_Array, Current, Next, Previous, End, Each, Sort, Array_Merge, Array_Reverse), File Functions(Fopen, Fread, Fwrite, Fclose)in Programming .

UNIT-III: Working With Data And Forms:

Steps to Create an Input Form (Text Fields, Text Areas, Check Boxes, Radio Buttons, List Boxes, Password Controls, Hidden Controls, Image Maps, File Uploads, Buttons), Steps to Use Using PHP\$_Get And \$_Post, \$_Request Method for a Given Application, Combining HTML and PHP Codes Together on Single Page, Redirecting the User.

UNIT-IV: Session, Cookies And Error Handling:

Use Cookie to Store and Retrieve Data, Use Querystring to Transfer Data, Create Session Variable and Handle Session, Starting and Destroying Session Working with Session Variables, Passing Session IDs, Handle Runtime Errors Through Exception Handling, Error Types in PHP. Database Connectivity Using MYSQL:Concepts and Installation Of Mysql, Mysql Structure and Syntax, Types of Mysql Tables and Storage Engines, Mysql Commands, Integration of PHP with Mysql, Connection to the Mysql Database, Creating And Deleting Mysql Database Using PHP, Updating, Inserting, Deleting Records in the Mysql Database, Hosting Website (Using “C” Panel, Using FileZilla Software)

UNIT-V: Java Server Pages Basics:

Integrating Scripts in JSP, JSP Objects and Components, Configuration and Troubleshooting,JSP: Request and Response Objects, Retrievingthe Contents of An HTML Form, Retrievinga Query String, Working with Beans, Cookies, Creating and Reading Cookies. Using Application Objects and Event Handling.

Text Books:

1. W. Jason Gilmore,“Beginning PHP and MySQL”, 4th Edition, Apress, 2010
2. Steven Holzner,“PHP: The Complete Reference”, Tata McGraw-Hill, 2008
3. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5”, Third Edition, O'reillyMedia, 2014

Reference Books:

1. Julie C. Meloni, “Teach yourself PHP, MySQL and Apache All in one”, 5th Edition,Pearson Education, 2012
2. Phil Hanna, “JSP 2.0: The Complete Reference”, Tata McGrawHill, 2011.

List of Practical's:

1. Write a PHP script to display Welcome message.
2. Write a PHP script to demonstrate arithmetic operators, comparison operator, andlogical operator.
3. Write PHP Script to print Fibonacci series.
4. Write PHP script to demonstrate Variable function
5. Write PHP script to demonstrate string function.
6. Write PHP script to demonstrate Array functions.
7. Create student registration form using text box, check box, radio button, select,submit button. And display user inserted value in new PHP page.
8. Write two different PHP script to demonstrate passing variables through a URL.
9. Write PHP script to demonstrate passing variables with cookies.
10. Write an example of Error-handling using exceptions.
11. Write a PHP script to connect MySQL server from your website.
12. Write a program to read customer information like cust_no, cust_name, item_purchase, and mob_no, from customer table and display all these information intable format on output screen.
13. Write a program to read employee information like emp_no, emp_name, designationand salary from EMP table and display all this information using table format.
14. Create a dynamic web site using PHP and MySQL.
15. Write a program for JSP scriptlet tag that prints the user name
16. Write a program for JSP expression tag that prints current time
17. Write a program for JSP declaration tag that declares method
18. Write a program for JSP for request and response implicit object
19. Write a program for JSP for session implicit object
20. Write a program for JSP for exception implicit object
21. Write a program for JSP for Simple example of java bean class
22. Write a program for JSP for JSP Action Tags

S.2 Technical Presentation Skills (BTCS-610)

COURSE OUTCOMES

Upon completion of the subject, students will be able to:

1. Ability to review, prepare and present technological developments.
2. Ability to face the placement interviews.
3. Ability to effectively communicate technical material in print.
4. Ability to present technical material orally with confidence and poise.
5. Ability to present technical material using audiovisual materials.
6. Ability to communicate technical material to a variety of audiences, from members of the building and engineering trades and medical fields to government representatives and the general public.
7. Ability to work well in teams.

TEXT BOOKS:

1. The Chicago Manual of Style, 13th Edition, Prentice Hall of India 1989.
2. Gowers Ernest, "The Complete Plan in Words" Penguin, 1973.
3. Menzel D.H., Jones H.M, Boyd, LG., "Writing a Technical Paper". McGraw Hill, 1961.
4. Strunk, W., & White E.B., "The Elements of Style", 3rd Edition , McMillan, 1979.

REFERENCES:

1. Turbian K.L., "A Manual for Writers of Term Papers, Thesis and dissertations" Univ of Chicago Press, 1973.
 2. IEEE Transactions on "Written and Oral Communication" has many papers.
- S.3 Introduction to Core Java (BTIT-309)

UNIT I The Java Environment:

Basic History of Java and its Features, JVM, JRE and JDK, its Libraries and Functionalities, Why Java? Installing Java, Java Classes and Objects, Variables and Data Types Conditional and Looping Constructs, Arrays.

UNIT II The Java Language:

Constructors, Inheritance, Packages and Interfaces, Access Specifier, Enumerations, Auto boxing, and Annotations (Metadata) Garbage collection, Nested Classes, Inner Classes

UNIT III Performance:

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, The Idea Behind Exception, Exceptions and Errors, Types of Exception, Control Flow in Exceptions, JVM Reaction to Exceptions, Use of Try, Catch, Finally, Throw, Throws in Exception Handling, In-Built and User Defined Exceptions, Checked and Un Checked Exceptions, Generics, Lambda Expressions.

UNIT IV The Java Library:

String Handling, Exploring Java.Lang, Java.Util – The Collection Framework, Exploring Java.IO, Exploring Java. NIO.

UNIT V Database Connectivity with JDBC:

Introduction to JDBC, JDBC Drivers & Architecture, CRUD Operation using JDBC

Text Books:

1. Kishore Sharan, "Beginning Java 8 Language Features", Apress, 2014
2. E. Balagurusamy, "Programming with java A Primer", Fourth Edition, Tata McGraw Hill, 2009.
3. Sharanam Shah, "Core Java 8 for Beginners", Shroff Publisher, 2015.

Reference Books:

1. Herbert Schildt, "The Complete Reference Java", Ninth Edition, McGraw Hill, 2014
2. Bert Bates, Kathy Sierra, "Head First Java", 2nd Edition, O' Reilly, 2005
3. Cay S Horstman and Gary Cornell, "Core Java", Vol I & II, Pearson Education, 2013

List of Practical:

1. Write a program to show concept of Class in Java?
2. Write a program showing Type Casting
3. Write a program showing Different type of inheritance
4. Write a program showing Different types of Polymorphism
5. Write a program showing Encapsulation
6. Write a program showing Abstraction
7. Write a Multithreaded program
8. Write a program showing Checked and Unchecked Exception
9. Write a program showing Database connectivity.
10. Write a program showing Simple database Operation (CRUD)

S.4 Operating Systems (BTCS-502)

UNIT I Introduction to Operating System:

Introduction and Need of operating system, Layered Architecture/Logical Structure of Operating system, Type of OS(Multiprogramming , Time Sharing, Real Time ,Networked, Distributed, Clustered, Hand Held), Operating system as Resource Manager and Virtual Machine, OS Services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader. Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

UNIT II Process Management:

Process Model, Creation, Termination, States & Transitions, Hierarchy, Context Switching, Process Implementation, Process Control Block, Basic System calls- Linux & Windows. Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue scheduling

UNIT III Interprocess Communication:

Introduction to Message Passing, Race Condition, Critical Section Problem, Peterson's Solution, Semaphore, Classical Problems of Synchronization Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Sleeping Barber Problem etc. Deadlock- System model, Resource types, Deadlock Problem, Deadlock Characterization, Methods for

Deadlock Handling, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock Detection, Recovery from Deadlock.

UNIT IV Memory Management:

concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit and quick fit. Free space management- bitmap, link list/free list. Virtual Memory- concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging ,working set model, page fault frequency, thrashing, page replacement algorithms- optimal, FIFO, LRU; Bready's anomaly; TLB (translation look aside buffer).

UNIT V File Management:

Concepts, Naming, Attributes, Operations, Types, Structure, File Organization & Access (Sequential, Direct, Index Sequential) Methods, Memory Mapped Files, Directory Structures One Level, Two Level, Hierarchical/Tree, Acyclic Graph, General Graph, File System Mounting, File Sharing, Path Name, Directory Operations, Overview Of File System in Linux & Windows. Input/output Subsystems- Concepts, Functions/Goals, Input/Output devices- Block And Character, Spooling, Disk Structure & Operation, Disk Attachment, Disk Storage Capacity, Disk Scheduling Algorithm- FCFS, SSTF, Scan Scheduling, C-Scan Schedule.

Text books:

1. Abraham Silberschatz, "Operating system concepts", 10th Edition, John Wiley & Sons. INC, 2018
2. Andrew S. Tannanbaum, "Modern operating system", 4th Edition, Pearson Education, 2014
3. Dhananjay M. Dhamdhere, "Operating Systems: A Concept Based Approach", 3rd Edition TMH, 2017,
4. Sibsankar Haldar, Alex Alagarsamy Aravind, "Operating System", 8th Edition, Pearson Education India, 2010

Reference Books:

1. Achyut S Godbole, "Operating System", 3rd TMH, 2017.
2. William Stallings, "operating system" 8th, Pearson Education, 2014.
3. Vijay Shukla, "Operating System", 3rd, Kataria & Sons, 2013.
4. Singh & Shivratri, "Advanced Concept in Operating Systems", 1st, Tata McGraw Hill Education, edition 2017.

List of Practical:

1. Implement and update the BIOS settings of your PC.
2. If there are 5 printers are connected in a system each process to print will take different time to complete, and CPU will give a fixed time to each process after that deadline next process will enter in CPU. If a problem not completed in a given slot then that process will be reenter as per the FCFS, on rotation basis? Apply the scheduling on this?
3. Implement Non Preemptive Priority CPU Scheduling.
4. Implement Non Preemptive Shortest Job First CPU Scheduling.
5. If there are 5 different resources like 3 printer, 2 scanner are connected to a system each taking different time to complete the task. Which scheduling is best and gives best performance of CPU?

6. Implement the scheduling for that where CPU give chance to complete those process first which comes first?
7. Implement Round-Robin CPU scheduling.
8. Write a program to implement Semaphore.
9. Find the solution for the situation where 5 faculties are sitting in a round table. There are 4 ball pens are placed on this table. At a time only one pen can be picked by one faculty to writing work. What will happen if all picked the pen for writing simultaneously?
10. Find the solution for dentist checkup clinic where only one chair and one dentist is available for treatment. And having n chairs to waiting for patient.
 - If there is no patient, then the doctor sleeps in his own chair.
 - When a patient arrives, he has to wake up the doctor.
 - If there are many patients and the doctor is doing treatment of him, then the remaining patients either wait if there are empty chairs in the waiting room or they leave if no chairs are empty.
11. Write a program for Memory Management Algorithms e.g. First Fit, Best Fit, Worst Fit.
12. Demonstrate Virtual memory Techniques like, LRU, FIFO etc.
13. Implement Shortest Seek Time First Disk Scheduling Algorithm.
14. Implement Scan Scheduling Disk Scheduling Algorithm.
15. Implement Circular Scan Disk Scheduling Algorithm.
16. Implement Look Disk Scheduling Algorithm.

S.5 Discrete Structures (BTIT-401)

UNIT I Set Theory:

Definition Of Sets, Venn Diagrams, Complements, Cartesian Products, Power Sets, Counting Principle, Cardinality and Countability (Countable And Uncountable Sets), Proofs of Some General Identities on Sets, Pigeonhole Principle. Relation: Definition, Types of Relation, Composition of Relations, Domain and Range of a Relation, Pictorial Representation of Relation, Properties of Relation, Partial Ordering Relation. Function: Definition and Types of Function, Composition of Functions, Recursively Defined Functions.

UNIT II Propositional Logic:

Proposition Logic, Basic Logic, Logical Connectives, Truth Tables, Tautologies, Contradiction, Normal Forms (Conjunctive and Disjunctive), Modus Ponens and Modus Tollens, Validity, Predicate Logic, Universal and Existential Quantification. Notion of Proof: Proof by Implication, Converse, Inverse, Contrapositive, Negation, and Contradiction, Direct Proof, Proof by Using Truth Table, Proof by Counter Example

UNIT III Graph Theory:

Terminology Graph Representation Graph Isomorphism; Connectedness; Various Graph Properties; Euler and Hamiltonian Graph; Shortest Paths Algorithms. Trees: Terminology, Tree Traversals; Prefix Codes, Spanning Trees, Minimum Spanning Trees.

UNIT IV Algebraic Structure:

Binary Composition and its Properties Definition of Algebraic Structure; Groyas Semi Group, Monoid Groups, Abelian Group, Properties of Groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (Definition and Standard Results).

UNIT V Posets, Hasse Diagram And Lattices:

Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded and Complemented Lattices.
Combinatorics: Introduction, Permutation and Combination, Binomial Theorem, Multinomial Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive Algorithms, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions, Generating Functions, Solution by Method of Generating Functions.

Text Books:

1. C.L.Liu, "Elements of Discrete Mathematics", 4th Edition, Tata McGraw-Hill, 2012.
2. Kenneth H. Rosen, "Discrete Mathematics and its applications", 7th Edition, Tata McGraw-Hill, 2012.
3. V. Krishnamurthy, "Combinatorics: Theory and Applications", 2nd Edition, East-West Press, 2008.
4. Seymour Lipschutz, M.Lipson, "Discrete Mathematics", 3rd Edition, Tata McGraw Hill, 2009.

Reference Books:

1. Trembley, J.P & Manohar; "Discrete Mathematical Structure with Application CS", Tata McGraw Hill.
2. Bisht, "Discrete Mathematics", Oxford University Press, 2015.
3. Biswal, "Discrete Mathematics & Graph Theory", 3rd Edition, PHI, 2011.

S.6 Data Communication (BTCS-302)

UNIT I Introduction:

Data Communication Components, Types of Connections, Transmission Modes, Network Devices, Topologies, Protocols and Standards, OSI Model, Transmission Media, Bandwidth, Bit Rate, Bit Length, Baseband and Broadband Transmission, Attenuation, Distortion, Noise, Throughout, Delay and Jitter.

UNIT II Data Encoding:

Unipolar, Polar, Bipolar, Line and Block Codes. Multiplexing: Introduction and History, FDM, TDM, WDM, Synchronous and Statistical TDM. Synchronous and Asynchronous transmission, Serial and Parallel Transmission.

UNIT III Error Detection & Correction:

Correction, Introduction–Block Coding–Hamming Distance, CRC, Flow Control and Error Control, Stop and Wait, Error Detection and Error Go Back– N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, CSMA/CD, CDMA/CA

UNIT IV Network Switching Techniques:

Circuit, Message, Packet and Hybrid Switching Techniques. X.25, ISDN. Logical Addressing, Ipv4, Ipv6, Address Mapping, ARP, RARP, BOOTP and DHCP, User Datagram Protocol, Transmission Control Protocol, SCTP.

UNIT V Application Layer Protocols:

Domain Name Service Protocol, File Transfer Protocol, TELNET, WWW and Hyper Text Transfer Protocol, Simple Network Management Protocol, Simple Mail Transfer Protocol, Post Office Protocol v3.

Text books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw Hill, 2011.

Reference Books:

1. Larry L. Peterson, Peter S. Davie, “Computer Networks”, Fifth Edition, Elsevier, 2012.
2. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.
3. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

S.7 Analysis and Design of Algorithms (BTIT-305)

UNIT 1 Algorithms Designing:

Algorithms, Analyzing Algorithms, Asymptotic Notations, Heap and Heap Sort, Brief Review of Graphs, Sets and Disjoint Set Union, Sorting and Searching Algorithms and their Analysis in terms of Space and Time Complexity. Divide and Conquer: General Method, Binary Search, Merge Sort, Quick Sort, Selection Sort, Strassen’s Matrix Multiplication Algorithms.

UNIT II Greedy Method:

General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths. UNIT III Dynamic Programming: General Method, Optimal Binary Search Trees, 0/1 Knapsack, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV Backtracking:

General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets. Branch and Bound: Method, O/1 Knapsack Problem, Traveling Salesperson Problem, Efficiency Considerations, Techniques for Algebraic Problems, Some Lower Bounds on Parallel Computations.

UNIT V NP Hard and NP Complete Problems:

Basic Concepts, Cook's Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

Text Books:

1. Ellis Horowitz and Sartaj Sahni, "Fundamental of Computer Algorithms", 2nd Edition, Galgotia Publication, 2001.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest "Introduction to Algorithms", 3rd Edition, MIT Press. 2009.
3. Donald E Knuth, "Fundamentals of Algorithms: The Art of Computer Programming" Vol 1, 3rd Edition, Pearson Education, 1997.

Reference Books:

1. Goodman, S.E. & Hedetniemi, "Introduction to Design and Analysis of Algorithm", Tata McGraw Hill, 1977.
2. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, "Algorithms", Tata McGraw Hill, 2006.
3. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms" TMH Publication.
4. Michael T Goodrich and Roberto Tamassia "Algorithm Design", Wiley India.

List of Practical:

1. Write a program for Iterative and Recursive Binary Search.
2. Write a program for Merge Sort.
3. Write a program for Quick Sort.
4. Write a program for Strassen's Matrix Multiplication.
5. Write a program for minimum spanning trees using Kruskal's algorithm.
6. Write a program for minimum spanning trees using Prim's algorithm.
7. Write a program for single sources shortest path algorithm.
8. Write a program for Floyd-Warshall algorithm.

9. Write a program for traveling salesman problem.
10. Write a program for Hamiltonian cycle problem.

- Sem 4

S.1 Mobile App Development Lab (BTIT-306)

UNIT-I

Introduction to mobile Devices and Administrative, Mobile Devices vs. Desktop devices - ARM and Intel Architectures - Power Management - Screen Resolution - Touch interfaces - Application development - App Store, Google Play, Windows Store - Development Environments Introduction: XCode , Eclipse , PhoneGAP, etc - Native vs. web applications.

UNIT-II

Mobile OS Architectures:Comparing and Contrasting architectures of all three – Android, iOS and Windows - Underlying OS (Darwin vs. Linux vs. Win 8) - Kernel structure and native level programming - Runtime (Objective-C vs. Dalvik vs. WinRT) - Approaches to Power Management – Security.

UNIT-III

Introduction to Android Development Environment, Android/iOS/Win 8 Survival and basic apps, Mobile frameworks, Tools, Native Level Programming on Android Low-level programming on (jailbroken) iOS or Windows low level APIs. Study Different Open Source Frameworks, Tools And Basic Languages Used For Mobile Development

UNIT-IV

Intents and Service: Android ,Intents and Services , Characteristics of Mobile Applications, Successful Mobile Development, Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Android Storing and Retrieving Data ,Working with a Content Provider, Communications Via Network and the Web, State Machine, Correct Communications Model

UNIT-V

Android Networking and Web , Telephony, Wireless Connectivity and Mobile Apps, Notifications and Alarms, Memory Management, Graphics Performance and Multithreading, Graphics and UI Performance Android Graphics and MultimediaMobile Agents , Location Mobility and Location Based Packaging and DeployingPerformance Best Practices.

TEXT BOOKS:

1. John Horton, “Android Programming for Beginners: Build in-depth, full-featured Android apps starting from zero programming experience” 2nd Edition, Packt Publishing, October 31, 2018
2. Mike van Drongelen, Aravind Krishnaswamy, “Lean Mobile App Development”, 2nd edition, Packt Publishing, 28 Nov 2017
3. Chris Griffith , “Mobile App Development with Ionic”, Revised Edition, O'Reilly Media, August 2017
4. Rick Boyer , Kyle Mew, “Android Application Development Cookbook” 2nd Revised Edition, Packt Publishing, March 31, 2016
5. Christian Keur “iOS Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides) ” 6 edition Big Nerd Ranch Guides Publishing 27 Dec. 2016

REFERENCES:

1. <http://www.tutorialspoint.com/android/>
2. <https://www.lynda.com/Mobile-Apps-training-tutorials>
3. https://www.tutorialspoint.com/ios/ios_objective_c.htm
4. <https://developer.android.com/training/basics/>

LIST OF EXPERIMENTS:

1. Study of difference open source mobile development tools.

- 2. Installation of eclipse and Android Studio.**
- 3. Develop an application that uses GUI components, Font and Colors.**
- 4. Develop an application that uses Layout Managers and event listeners.**
- 5. Develop a native calculator application.**
- 6. Develop an application that draws basic graphical primitives on the screen.**
- 7. Develop an application that makes use of database.**
- 8. Develop an application that makes use of RSS Feed.**
- 9. Implement an application that implements Multi threading.**
- 10. Develop a native application that uses GPS location information.**
- 11. Implement an application that writes data to the SD card.**
- 12. Implement an application that creates an alert upon receiving a message.**
- 13. Develop a mobile application that creates alarm clock.**

S.2 Unix and Shell Programming Lab (BTIT-406)

UNIT-I Introduction to UNIX –

The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal and External Commands, Command Structure. General purpose utilities: cal, date, echo, printf, bc, script, passwd, path, who, uname, tty, stty, pwd, cd, mkdir, rmdir, od.

UNIT-II Handling Files and C Environment –

The File System, cat, cp, rm, mv, more, file, ls, wc, pg, cmp, comm, diff, gzip, tar, zip, df, du, mount, umount, chmod, The vi editor ,security by file Permissions. Networking commands: ping, telnet, ftp, finger, arp, rlogin. The C compiler, vi editor, compiler options, and run the programs.

UNIT-III: Shell Basics –

Types of shells, Shell Functionality, Work Environment, Writing script & executing basic script, Debugging script, Making interactive scripts, Variables (default variables), Mathematical expressions. Conditional statements: If-else-elif, Test command, Logical operators - AND, OR, NOT, Case –esac. Loops: While, For, Until, Break & continue.

UNIT-IV: Command Line Arguments & Regular Expression –

Command line arguments,Positional parameters, Set & shift, IFS. Functions & file manipulations: Processing file line by line, Functions. Regular Expression & Filters: Regular expression, Grep, cut, sort commands, Grep patterns.

UNIT-V: SED and AWK –

SED,Scripts, Operation, Addresses, commands, Applications, grep and sed. AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

Text Books:

- 1. Stephen Prata “Advanced UNIX: A Programming's Guide”, BPB Publications, 2017.**
- 2. Maurice J. Bach “Design of UNIX O.S. “, PHI Learning, 2015.**

3. Brian W. Kernighan & Rob Pike, “The UNIX Programming Environment”, PHI Learning, 2015.
4. Sumitabha Das: “YOUR UNIX – The Ultimate Guide”, Tata McGraw Hill, 23rdreprint, 2012.
5. Yashavant Kanetkar, “Unix Shell programming”, 1st Edition, BPB Publisher, 2010.

Reference Books:

1. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and Shell Programming”, 1st Edition, Cengage Learning India, 2003.
2. Graham Glass, King Ables, “Unix for programmers and users”, 3rd Edition, Pearson Education, 2009.
3. Sumitabha Das, “Unix Concepts and Applications”, 4th Edition. TMH, 2006.
4. N.B. Venkateswarlu, “Advanced Unix programming”, 2nd Edition, B S Publications, 2010.

List of Practical:

1. Perform installation of UNIX/LINUX operating system.
2. Study of UNIX general purpose utility commands.
3. Execution of various file/directory handling commands.
4. Working with the vi editor: Creating and editing a text file with the vi text editor using the standard vi editor commands.
5. Write a shell script for calculator (to perform basic arithmetic and logical calculations).
6. Write a shell script sum.sh that takes an unspecified number of command line arguments (up to 9) of ints and finds their sum. Modify the code to add a number to the sum only if the number is greater than 10.
7. Write a shell script that will take an input file and remove identical lines (or duplicate lines from the file).
8. Write a shell script takes the name a path (eg: /afs/andrew/course/15/123/handin), and counts all the sub directories (recursively).
9. Shell scripts to explore system variables such as PATH, HOME etc.
10. Write a shell script that takes a name of a folder as a command line argument, and produce a file that contains the names of all sub folders with size 0 (that is empty sub folders)
11. Execution of various system administrative commands.
12. Write awk script that uses all of its features.
13. Write a shell script to display list of users currently logged in.
14. Write a shell script to delete all the temporary files.
15. Write a shell script to search an element from an array using binary searching.
16. Write shell script to perform different string operations of arrays.

S.3 Advanced Java Programming (BTCS-409)

UNIT-I

J2EE Event Handling & GUI Design Event handling, AWT: Windows, Graphics, Text, AWT Controls, Layout Managers, and Menus, Images, GUI Programming with Swing, Exploring Swing, Swing Menu

UNIT-II

Java Servlet Overview, Servlet Interface, Request, Servlet context, response, Session, Dispatching request, Web Application

UNIT-III

JDBC Standard Extension 2.0 Introduction to databases (SQL ,No - SQL) Connecting to Databases – JDBC principles – Databases access – Interacting – Database search – Database support in Web applications MySQL , Model View Controller, JSP , HTML , CSS.

UNIT-IV

ORM and J2EE Frameworks: Introduction to Frameworks:- Struts, Spring basics, Spring AOP , Introduction to JavaScript and JQuery

UNIT-V

Advance J2EE Topic: JavaMail 1.2(Sending and Receiving Mail, Mail body design, different components), Java Messaging Service (JMS) 1.0.2 (Architecture, Programming Model, Connection, Session, Producer, Consumer), Java API for XML Parsing (JAXP) 1.1 (Introduction, Parsing and XML, when to use SAX)

TEXT BOOKS:

1. Arnold, Ken, James Gosling, and David Holmes. **The Java programming language**. Addison Wesley Professional, 2005.
2. Keogh, James. "The Complete Reference J2ME." published by McGrawHill OSBORNE Edition (2003)..
3. Allamaraju, Subrahmanyam, et al. "Professional Java Server Programming J2EE 1." (2001).
4. Deshmukh, Hanumant, and JigneshMalavia. SCWCD exam study kit: Java web component developer certification. Manning Publications Co., 2002.
5. Cay, Horstmann, and Cornell Gary. "Core Java 2, Volume II–Advanced Features." (2005).

REFERENCES:

1. Kito D. Mann, "Java Server Faces in Action",2nd Edition, Dreamtech Press , 4 January 2005
2. Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley, "JDBC™ API Tutorial and Reference" Third Edition, Addison Wesley, 11 June 2009).
3. GiulioZambon , "Beginning JSP, JSF and Tomcat", 2nd Edition , Apress ,29 September 2012.
4. AnghelLeonard , "JSF2.0 CookBook" ,3rd Edition , PACKT publication ,2010.
5. Bryan Basham, Kathy Sierra & Bert Bates, "Head First Servlets and JSP" , 3rd Edition , O'Reilly Media,2012.

LIST OF EXPERIMENTS:

1. How to set up multiple panels, compound borders, combo boxes.
2. Write a Program to implement Event handling.
3. Write a Program to develop Java Servlet and use request and response
4. Write a Program which allows the user to enter data in a jsp form and display in webpage
5. Show basic JDBC operation
6. Create Servlet file which contains following function:
 - 1) Connect
 - 2) Create Database
 - 3) Create table

- 4) Insert records into respective table
- 5) Update records of particular table of database
- 6) Delete records from table
- 7) Delete table and also Database.
- 7. Write a program to demonstrate Spring.
- 8. Write a program to demonstrate Spring JDBC operation.
- 9. Write a program to demonstrate Java Mail functionalities.
- 10. Write a program to demonstrate JMS queues.

S.4 Software Engineering and Project Management (BTCS-504)

UNIT-I Nature of Software:

Software Engineering, Software Process, A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models- Waterfall Model, Incremental Models, Evolutionary Models, Concurrent Models, Specialized Process Model, Unified Process, Personal and Team process Models, Process technology, Agile development.

UNIT-II Functional and Non-functional Requirements:

Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented Software Development, Use case Modeling, System and Software Requirement Specifications, Requirement Validation, Traceability.

UNIT-III The Software Design Process:

Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, SA/SD Component Based Design, Design Metrics.

UNIT-IV Software Testing Strategies-

Approach: Issues, Validation Testing and Their Criteria, System Testing, Alpha-Beta Testing, Debugging, Testing Conventional Applications, Testing Object Oriented Applications ,Testing Web Applications.

UNIT-V Need and Types of Maintenance:

Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance(SQA). Project Metrics.

Text Books:

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Tata McGraw-Hill, Seventh edition, 2009.
2. Richard Fairley, “Software Engineering Concepts” –, Tata McGraw Hill, 2008.
3. Pankaj Jalote ,”An Integrated Approach to Software Engineering”, Narosa Pub, 2005.
4. Richard H.Thayer,”Software Engineering & Project Managements”,Wiley India

Reference:

1. Bernd Bruegge, Allen H. Dutoit, "Object-Oriented Software Engineering" Using UML, Patterns, and Java, PEARSON Third Edition, 2017.
2. Waman S.Jawadekar, "Software Engineering", TMH
3. Ian Sommerville, "Software Engineering", Seventh Edition, Pearson Education Asia, 2007.
4. Rajib Mall, "Fundamentals of Software Engineering" Second Edition, PHI Learning.

List of Practical: Select a topic of the project, and then make the report on following points

1. System Analysis
 - 1.1. Identification of Need
 - 1.2. Preliminary Investigation
2. Feasibility Study
 - 2.1. Technical Feasibility
 - 2.2. Economical Feasibility
 - 2.3. Operational Feasibility
3. Literature Survey
 - 3.1. Work done by other
 - 3.2. Benefits
 - 3.3. Proposed Solution
 - 3.4. Technology used
4. Software Engineering Approach
 - 4.1. Software Engineering paradigm Applied
 - 4.1.1. Description
 - 4.1.2. Advantage & Disadvantages
 - 4.1.3. Reasons for use
 - 4.2 Requirement Analysis
 - 4.2.1 Software Requirement Specification
 - 4.2.1.1 Glossary
 - 4.2.1.2 Supplementary Specifications
 - 4.2.1.3 Use Case Model
 - 4.2.1.4 Comparative analysis documents
 - 4.2.2 Conceptual Level Activity Diagram
 - 4.3 Planning Managerial Issues
 - 4.3.1 Planning Scope
 - 4.3.2 Project Resources
 - 4.3.3 Team Organization
 - 4.3.4 Project Scheduling
 - 4.3.5 Estimation
 - 4.3.6 Risk Analysis
 - 4.3.7 Security Plan
 - 4.4 Design
 - 4.4.1. Design Concept
 - 4.4.2. Design Technique
 - 4.4.3. Modeling
 - 4.4.3.1. ER Model
 - 4.4.3.2. DFD Model

- 4.4.3.2.1. DFD Model Level-0 and 1**
- 4.4.3.2.2. DFD Model Level 2 and 3**
- 4.4.3.3. Data Dictionary**
- 4.4.3.4. Activity Diagram**
- 4.4.3.5. Software Architecture**

4.5 Implementation Phase

- 4.5.1. Language Used Characteristics**
- 4.5.2. Coding**

4.6 Testing

- 4.6.1. Testing Objectives**
- 4.6.2. Testing Methods & Strategies used along with test data and the error listed for each test case for each function provided by the system.**

S.5 Database Management Systems (BTCS-405)

UNIT I

Introduction:

Concept & Overview of DBMS, Purpose of Database Systems, Architecture of DBMS, Data Models and its type, Schema and Instances, Data Independence, DBA and its function.

Entity-Relationship Model:

Entities, Attributes and its types, Mapping Cardinalities, Keys, Entity Relationship Diagram, Weak entity set and Strong entity set and Extended E-R features (Generalization , Specialization, Aggregation) ,ER Diagram to Relational Table conversion.

UNIT-II

Relational Model:

Structure of Relational Databases, Relation , Characteristics of Relations, Domains, Tuples , Relational schema and instance, Relational Algebra, Relational Algebra Operations (select, project, join and its type, union, intersection, set difference, Cartesian product, rename, division), Extended Relational Algebra Operations (Generalized Projection , Aggregate Functions , Outer Join),

Relational Calculus:

types of relational calculus, tuple and domain oriented relational calculus, and its operation.

UNIT-III

Integrity Constraints:

Null Values, Domain Constraints, Entity Integrity Constraints Referential Integrity Constraints, Key constraints, Triggers.

Relational Database Design:

Functional Dependency, Inference rule, Different Anomalies in designing a Database. Normalization , Decomposition, Normal Forms (1NF, 2NF, 3NF, BoyceCodd Normal Form, Normalization using Multi-Valued Dependencies, 4NF, Join Dependency, 5NF), Canonical cover.

UNIT IV

Query Optimization:

Introduction, steps of optimization, various algorithms to implement select, project and join operations of relational algebra, optimization methods: heuristic based, cost estimation based.

Transaction Processing, Concurrency Control and Recovery Management:

Transaction Model properties, State Serializability, Lock base protocols, Two Phase Locking, Time Stamping Protocols for Concurrency Control, and Validation Based Protocol, Multiple Granularities, Granularity of Data Item. Multi version schemes, Recovery with Concurrent Transaction, Recovery technique based on Deferred Update and Immediate Update, Shadow Paging, Recovery in Multi Database System and Database Backup and Recovery from Catastrophic Failure.

UNIT V

Index structures:

Types of index (primary, secondary, clustering, partitioning, unique and non index), use and Purpose of index, searching via an index.

SQL: DDL, DML, DQL (column function and grouping, union, multiple queries, union all, sub-query using IN, NOT IN, HAVING, GROUP BY CLAUSE), DCL (grant, revoke), TCL (Commit, roll back, save point, set Transaction)

Distributed database:

Planning for distributed database, management-centralized and decentralized Back-up and recovery.

Text books:

- 1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.GrawHill, 6th Edition,2015.**
- 2. C J Date, “An Introduction to Database System”, Pearson Educations, 8th Edition, 2004.**
- 3. Elmasri, Navathe, “Fundamentals of Database Systems”, Pearson Educations 7th Edition, 2016.**
- 4. SeemaKedar, Database Management System, Technical Publications, 2009. 5.**
- 5.Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.**

Reference Books:

- 1. IBM Career Education- database management system.**
- 2. Abraham Silberschatz and S Sudarshan “Database System Concepts” 6th Edition McGraw-Hill Education – Europe 2013.**
- 3. Raghu Ramakrishnan and Johannes Gehrke “Database Management Systems” McGrawHill Education, 2003.**
- 4. Kahate, Atul “Introduction to Database Management Systems”Pearson Education India, 2006.**

List of Practical:

- 1. Design a Database and create required tables. For e.g. Bank, College Database.**
- 2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.**
- 3. Write a SQL statement for table and record handling like implementing INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements and DROP, ALTER statements.**

4. Write the queries for Retrieving Data from a Database Using the WHERE clause , Using Logical Operators in the WHERE clause , Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions and Combining Tables Using JOINS.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT () .
6. Write the query to implement the concept of Integrity constraints.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Display name, hire date of all employees using cursors.
10. Display details of first 5 highly paid employees using cursors.
11. Write a database trigger which fires if you try to insert, update, or delete after 7'o' clock.
12. Write a data base trigger, which acts just like primary key and does not allow duplicate values.
13. Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.
14. Write the query for creating the users and their role. Using GRANT and REVOKE operations

S.6 Environment and Energy Studies (ML-301)

UNIT I Environmental Pollution and Control Technologies:

Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and industrial pollution, Ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid Waste management composition and characteristics of e - Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, Secondary and Tertiary.

UNIT II Natural Resources: Classification of Resources:

Living and Non - Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problem, Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable energy source, case studies.

UNIT III Ecosystems:

Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Energy flow in the ecosystem, Biogeochemical cycles, Bioaccumulation, ecosystem value, devices and carrying capacity, Field visits.

UNIT IV Biodiversity and its Conservation:

Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, manwildlife conflicts; Conservation of biodiversity: In-situ and Exsitu conservation. National biodiversity act.

UNIT V Environmental Policy, Legislation & EIA:

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP).

Text Books:

1. Agarwal, K.C.,(latest edition).Environmental Biology, Bikaner :Nidi Pub. Ltd.
2. Brunner R.C.(latest edition) Hazardous Waste Incineration, McGraw Hill Inc.
3. Clank R.S. .,(latest edition. Marine Pollution, Clanderson Press Oxford (TB).
4. De A.K(latest edition) Environmental Chemistry, Wiley Western Ltd.
5. ErachBharucha(2005).Environmental Studies for Undergraduate Courses by for University Grants Commission.

Reference Books:

1. R. Rajagopalan(2006).Environmental Studies. Oxford University Press.
2. M. AnjiReddy(2006).Textbook of Environmental Sciences and Technology. BS Publication.
3. Richard T. Wright(2008).Enviromental Science: towards a sustainable future PHL Learning Private Ltd. New Delhi.
4. Gilbert M. Masters and Wendell P. Ela.(2008).Environmental Engineering and science. PHI Learning Pvt Ltd.
5. Daniel B. Botkin& Edwards A. Keller(2008).Environmental Science Wiley INDIA edition.
6. AnubhaKaushik(2009).EnviromentalStudies. New age international publishers.

S.7 Computer Networks(BTIT-502)

UNIT I Computer Network:

Definitions, Goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, TCP/IP model overview, Descriptions of various layers and its comparison with TCP/IP. Network standardization.

UNIT II Data Link Layer:

Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB.

UNIT III MAC Sublayer:

Overview of MAC Layer, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11 wireless Communication.

UNIT IV Network Layer:

Need, Services Provided, Design issues, Routing and congestion in network layer, wired & wireless routing protocol examples, Routing algorithms: Least Cost Routing algorithm,

Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multi cast Routing. IP protocol, IP Addresses, subnetting, Comparative study of IPv4 & IPv6, Mobile IP.

UNIT V Transport Layer:

Overview, Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Session layer: Overview, Authentication, Session layer protocol. Presentation layer: Overview, Data conversion, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler). Application Layer: Overview, WWW and HTTP, FTP, SSH.

Text Books:

1. Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.
2. Behrouz A. Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
3. William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
4. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
5. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

Reference Books:

1. Kaveh Pahlavan, Prashant Krishnamurthy, Networking Fundamentals, Wiley Publication, 2009.
2. Michael A. Gallo & William M. Hancock, Computer Communications & Networking Technologies, Cengagepearson publications, 2001.
3. Dimitri Bertsekas, Robert Gallager, Data Networks, PHI Publication, Second Edition, 1992.
4. Ulysses Black, Computer Networks, PHI Publication, Second Edition, 1993.

List of Practical:

1. Demonstrate Different Types of Network Equipment's.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.
4. Experiment with basic network command and Network configuration commands.
5. Examine network IP.
6. Write a program to implement various types of error correcting techniques.
7. Write a program to implement various types of farming methods.
8. Implement & simulate various types of routing algorithm.
9. Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
10. Simulate STOP AND WAIT Protocols on NS-2.
11. Simulate various Routing Protocol on NS-2.
12. Simulate various Network Topologies on NS-2.
13. Configuring routers, bridges and switches and gateway on NS-2.

- Sem 5

S.1 Scripting Languages (BTCS-607)

UNIT-I

Introduction of scripting languages, need of scripting, characteristics of scripting languages, uses of scripting languages, Introduction of client side scripting languages like JavaScript, VBScript, HTML5 (Structure), CSS3 (Designing), AJAX, jQuery, Server side scripting languages like PHP, ASP.NET (C# OR Visual Basic), C++, Java and JSP, Python, Ruby on Rails.

UNIT-II

PHP basic features, Embedding php code in your web pages, outputting the data to the browser, data types, variables, constants, expressions, string interpolation, control structure, function, creating a function, function library, Arrays, String & regular expression, Web forms, Files, Authentication, Uploading file with PHP, sending email using PHP.

UNIT-III

Python: Introduction to python languages, python syntax, statements, functions, build-in functions, methods, module in python, exception handling, integrated web application in python- Building small, efficient python web system, web application framework.

UNIT-IV

Introduction to Perl and scripting, scripts, programs, Web scripting and PERL names , values, variable, scalar expression, control structures, arrays, list, hashes, strings, patterns, and regular expression, subroutine.

UNIT-V

Introduction of Angular JS, Industrial usage of angular JS.benefits of Angular JS, Creation of Web application project using database, scripting, HTML, & CSS.

TEXT BOOKS:

1. **The World of Scripting Languages, David Barron, Wiley Publications.**
2. **Python Web Programming, Steve Holden and David Beazley, New Riders Publications.**
3. **Beginning PHP and MySQL, 3" Edition, Jason Gilmore, Apress Publications (Dream tech.).**

REFERENCES:

1. **Open Source Web Development with LAMP using Linux, Apache, MySQL, Pen and PHP, J.Lee and B.Ware(Addison Wesley) Pearson Education.**
2. **Programming Python,M.Lutz,SPD.**
3. **PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.**
4. **PHP 5.1,l.Bayross and S.Shah, The X Team, SPD.**
5. **Core Python Programming, Chun, Pearson Education.**

6. Guide to Programming with Python, M.Dawson, Cengage Learning.
7. Pen by Example, E.Quigley, Pearson Education.
8. Programming Perl,Larry Wall, T.Christiansen and J.Orwant,O'Reilly, SPD.
9. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
10. PHP and MySQL by Example, E.Quigley, Prentice Hall(Pearson).
11. Perl Power, J.RFlynt, Cengage Learning.
12. PHP Programming solutions, V.Vaswani, TMH.

LIST OF EXPERIMENTS:

1. Javascript program to generate Fibonacci series and to look for motifs and patterns in sequences.
2. Javascript program to find out frequency of characters existing in nucleotide and protein sequences 6 Javascript's implementation to generate dynamic HTML pages.
3. Write PHP programs to do basic operations to deal with strings, and arrays, and to implement various mathematical functions.
4. Development of an PHP program to take set of sequences and find out conserved sequences.
5. Create a MySQL database tables and execute all SQL queries.
6. Write a PHP program to connect MySQL database and execute all SQL commands.
7. Construct a PHP interface for a given Web page and to produce its overall connectivity
8. Implement database and server site connectivity all together to generate complete dynamic web based applications through PHP, HTML and MySQL.
9. Write programs in Perl to implement string handling and other functions to be implemented to deal with biological data management.
10. Write PHP programs to do basic server side programming.

S.2 Programming with Python (BTCS-407)

UNIT-I Introduction to Python:

The basic elements of Python, Branching programs, Strings and Input, Iteration. Functions, Scoping and Abstraction: Functions and Scoping, Specifications, Recursion, Global variables, Modules, Files.

UNIT-II Testing and Debugging:

Testing, Debugging. Structured Types, Mutability and Higher order Functions: Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries.

UNIT-III Exceptions and assertions:

Handling exceptions, Exceptions as a control flow mechanism, Assertions. Classes and Object oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and information hiding.

UNIT-IV Some simple Algorithms and Data Structures:

Search Algorithms, Sorting Algorithms, Hashtables. Plotting and more about Classes: Plotting using PyLab, Plotting mortgages and extended examples.

UNIT-V Dynamic Programming:

Fibonacci sequence revisited, Dynamic programming and the 0/1 Knapsack algorithm, Dynamic programming and divide and conquer.

TEXT BOOKS:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.
3. Mark Lutz "Learning Python" O'Reilly Media; 5 edition.
4. David Beazley "Python Cookbook, Third edition" O'Reilly Media

REFERENCES:

1. Python Essential Reference, 4th Edition Addison-Wesley Professional.
2. Mark Lutz "Programming Python: Powerful Object-Oriented Programming" David Beazley "Python Cookbook" Third edition, O'Reilly Media

LIST OF EXPERIMENTS:

1. Write a Python Program to Print Hello world!
2. Write a Program to Add Two Numbers.
3. Write a Program to Find the Square Root.
4. Write a Program to Calculate the Area of a Triangle.
5. Write a Program to Solve Quadratic Equation.
6. Write a Program to Swap Two Variables.
7. Write a Program to Generate a Random Number.
8. Write a Program to Convert Kilometers to Miles.
9. Write a Program to Convert Celsius To Fahrenheit.
10. Write a Program to check if a number is positive, negative or zero.
11. Write a Program to Check if a Number is Odd or Even.
12. Write a Program to Check Leap Year.
13. Write a Program to Find the Largest Among Three Numbers.
14. Write a Program to Check Prime Number.
15. Write a Program to Print all Prime Numbers in an Interval.
16. Write a Program to Find the Factorial of a Number.
17. Write a Program to Display the multiplication Table.
18. Write a Program to Print the Fibonacci sequence.
19. Write an English sentence with understandable semantics but incorrect syntax. Write another English sentence which has correct syntax but has semantic errors.
20. Create a program that prompts the user for a number of gallons of gasoline. Reprint that value along with its conversion equivalent number of liters.
21. Write a program that allows a user to enter his or her two favorite foods. The program should then print out the name of a new food by joining the original food names together.
22. Write a Tipper program where the user enters a restaurant bill total. The program should then display two amounts: a 15 percent tip and a 20 percent tip.
23. Write a Car Salesman program where the user enters the base price of a car. The program should add on a bunch of extra fees such as tax, license, dealer prep, and destination charge. Make tax and license a percent of the base price. The other fees should be set values. Display the actual price of the car once all the extras are applied.

- 24. Create a program with a function that calculates the area of a circle by taking a radius from the user.**
- 25. Write your own sum function called mySum that takes a list as a parameter and returns the accumulated sum.**

S.3 MANAGEMENT INFORMATION SYSTEM (BTIT-513)

UNIT-I Organizations and Computing:

Introduction, Modern Organization-IT enabled- NetworkedDispersed- Knowledge Organization, Information Systems in Organizations- what are information systems?, Brief history of computing- ENIAC: Way to commercial computers- Advent of artificial intelligence- advent of personal computing-Free Software Movement- Advent of Internet, The role of internet- Internet and Web: they are different-the internet changes everything

UNIT-II Managing Information Systems in Organizations:

Introduction, Managing in the Internet Era, Managing Information Systems in Organization- the IT interaction model, Challenges for the managerwhat information to build?-how much to spend on information systems?-what level of capabilities should be created with information systems?-how centralized should the services be?-what security levels are required?-what is technology road map for the organization?

UNIT-III Data and Information:

Introduction, data and information- measuring data, information as a resource, information in organizational functions, types of information technology, types of information systemstransaction processing systems-management information system.

UNIT-IV Decision making and communication:

Introduction, Decision making with MIS-Tactical decisionsoperational decisions-strategic decisions, communication in organizations- types of communicationexamples of communications in organizations- decision making with communication technology

UNIT-V Strategy:

Introduction, Information goods-properties-technology lock-in and switching costs-network externalities-positive feedback-tippy markets, information systems and competitive strategy-value chain, the Role of CIO-information system's plan-vendor coordination-technology updates-return on investment on technology.

TEXT BOOKS:

- 1. Kenneth C. Laudon& Jane P. Laudon, Essentials of Management Information Systems, Tenth Edition, Pearson Prentice, Hall, 2012**
- 2. Terry Lucey, Management Information Systems, Ninth Edition, 2005, Thompson.**

S.4 ENTERPRISE RESOURCE PLANNING (BTIT-712)

Unit I: Introduction to ERP

- 1. Enterprise Resource Planning –Introduction**
- 2. Need of ERP**
- 3. Advantages of ERP**
- 4. Growth of ERP**

Unit II: ERP and Related Technologies

- 1. Business process Reengineering (BPR)**
- 2. Management Information System (MIS)**
- 3. Decision Support Systems (DSS) Executive Support Systems (ESS)**
- 4. Data Warehousing**
- 5. Data Mining**
- 6. Online Analytical Processing (OLTP)**
- 7. Supply Chain Management (SCM)**
- 8. Customer Relationship Management (CRM)**

Unit III: Modules of ERP

- 1. ERP modules & Vendors** Finance Production planning, control & maintenance Sales & Distribution Human Resource Management (HRM)
- 2. Inventory Control System.**
- 3. Quality Management** ERP Market

Unit IV:

- 1. ERP Implementation**
- 2. ERP Implementation Life Cycles** Evaluation and selection of ERP package
- 3. Project planning Implementation**
- 4. Team training & testing**
- 5. End user training & Going Live**
- 6. Post Evaluation & Maintenance.**

Unit V: Post implementation of ERP

- 5. ERP Case Studies** Post implementation review of ERP Packages in Manufacturing Services

REFERENCES:

- 1. Leon, A. (2008). Enterprise Resource Planning.** New Delhi; Tata McGraw-Hil Education
- 2. Kumar, V., Venkitakrishna, N. K. (1998). ERP - Concepts and Practice.** New Delhi; PHI
- 3. Garg, Venkitakrishnan (2003).ERP Concepts and Planning.** New Delhi; PHI Learning.

S.5 INFORMATION STORAGE AND MANAGEMENT (BTIT-611)

Unit-I: Introduction:

Digital data and its types, Information storage, Key characteristics of data center, Evolution of computing platforms. Introduction to storage technology: Data Proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

Unit-II: Storage System Architecture:

Intelligent disk subsystems overview, Contrast of integrants modular array, Component Architecture of Intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

Unit-III: Introduction to network storage:

JBOD, DAS, NAS, SAN & CAS evolution and comparison, Applications, Elements, Connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN

Unit-IV: Hybrid storage solutions and virtualization:

memory, network, server, storage & appliances. Data centre concepts & requirements, Backup and disaster recovery. Industry Management standards, standard framework applications, Key management metrics.

Unit-V: Information storage on clouds:

concept of cloud, cloud computing, storage on cloud, Cloud benefits, Cloud computing evolution. Application & services on cloud, cloud service providers, cloud deployment models, Essential characteristics of cloud computing.

TEXT BOOK:

5. G.Somasundaram & Alok Shrivastava editors, ISM: Storing, Managing, and Protecting Digital Information; Wiley India

REFERENCES:

1. Saurabh; Cloud Computing : Insight into New era Infrastructure; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained: Basic and application of fiber channels, SAN, NAS, ISESI, INFINIBAND and FCOE, Wiley India.
3. Sosinsky, Cloud Computing Bible, Wiley India.

S.6 WIRELESS COMMUNICATION NETWORKS (BTIT-511)

UNIT-I Introduction to Wireless Communication System:

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Second generation Cellular Networks, Third Generation (3G) Wireless Networks ,Wireless Local Loop(WLL),Wireless Local Area network(WLAN),

UNIT-II The Cellular Concept- System Design Fundamentals:

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Cochannel and adjacent interference, Hand off Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization, Repeaters, Micro cell zone concept, Channel antenna system design considerations.

UNIT-III Mobile Radio Propagation Model, Small Scale Fading and diversity:

Large scale path loss:-Free Space Propagation loss equation, Path-loss of NLOS and LOS systems, Reflection, Ray ground reflection model, Diffraction, Scattering, Link budget design, Max. Distance Coverage formula, Empirical formula for path loss, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread, Feher's delay spread, Types of small scale Fading, Rayleigh and rician distribution.

UNIT-IV Multiple Access Techniques:

Introduction, Comparisons of multiple Access Strategies TDMA, CDMA, FDMA, OFDM, CSMA Protocols. Mobile Network And Transport Layers :Mobile IP , Dynamic Host Configuration Protocol, Mobile Ad Hoc Routing Protocols, Multicast routing, TCP over Wireless Networks , Indirect TCP , Snooping TCP, Mobile TCP .Wireless Systems: GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, CDMA forward channels, CDMA reverse channels, Soft hand off, CDMA features, Power control in CDMA, Performance of CDMA System, GPRS system architecture.

UNIT-V

Introduction to Wi-Fi, WiMAX, Zig-Bee Networks, Software Defined Radio, UWB Radio, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network. Application Layer :WAP Model, Mobile Location based services ,WAP Gateway ,WAP protocols wireless bearers for WAP , WML ,WMLScripts.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education,
2. William Stallings, “Wireless Communications and Networks”, Pearson Education.
3. William D Stanley : Network Analysis with Applications, Pearson Education.
4. Roy Choudhary D: Network and systems, New Age Publication.
5. Wireless Communication, Theodore S. Rappaport, Prentice hall

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, “Principles of Wireless Networks”, First Edition, Pearson Education, 200UNIT III.
2. Uwe Hansmann,Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 200UNIT III.
3. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.
4. Wireless digital communication, Kamilo Feher, PH.

UNIT I Introduction to Computer Graphics:-

What is Computer Graphics?, Where Computer Generated pictures are used, Elements of Pictures created in Computer Graphics Graphics display devices,Graphics input primitives and Devices.Introduction to openGL:- Getting started Making pictures, Drawing basic primitivesSimple interaction with mouse and keyboard

UNIT II Points and Lines, AntialiasingLine Drawing Algorithm:-

DDA line drawing algorithm, parallel drawing algorithmBresenham's drawing algorithm with example. Circle and Ellipse generating algorithms:-Mid-point Circle algorithm with example Mid-point Ellipse algorithmMid-point Ellipse algorithm with example Parametric Cubic Curves:- Bezier curvesB-Spline curves Filled Area Primitives:-Scan line polygon fill algorithm, Pattern fill algorithm Inside-Outside Tests, Boundary fill algorithms, Flood fill algorithms

UNIT III

2D Geometric Transformations -

Basic transformation, Matrix representation and Homogeneous Coordinates Composite transformationOther transformations.Transformation between coordinated systems.Window to Viewport coordinate transformation,

Clipping operations –

Point clipping, Line clipping:-Cohen – Sutherland line clippingLiang – Barsky line clippingMidpoint subdivision

Polygon Clipping-Sutherland –

Hodgeman polygon clippingWeiler – Atherton polygon clipping.3D object representation methods B-REP , sweep representations , CSG

Basic transformations-

Translation,Rotation, Scaling

Other transformations-

Reflection,Rotation about an arbitrary axis Composite transformations Projections – Parallel and Perspective 3D clipping

UNIT IV

3D Geometric Transformations and 3D Viewing Classification of Visible

Surface Detection algorithm:-

Translation,Rotation, Scaling

Other transformations:-

Reflection,Rotation about an arbitrary axis Composite transformations Projections,Back Surface detection method Depth Buffer method Scan line method BSP tree method, Area Subdivision method.

UNIT V Multimedia System:

An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards.i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP, MOV, MPEG , compression standards, compression through spatial and temporal redundancy. Multimedia Authoring .

TEXT BOOKS:

1. Sinha and Udai , "Computer Graphics", Tata McGraw Hill
2. Parekh "Principles of Multimedia" Tata McGraw Hill
3. Prabhat k Andleigh, KiranThakral , "Multimedia System Design " PHI Pub.
4. Donald Hearn and M.P. Becker "Computer Graphics" Pearson Pub.

REFERENCES:

1. Computer Graphics, C Version, 2e Paperback – 2002
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. David F Rogers, "Procedural elements for Computer Graphics", Tata McGraw Hill, Second Edition.
5. Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice in C", Second edition, Pearson Education.
6. David Hillmaa, "Multimedia Technology & Applications, Delmar, 1998.

LIST OF EXPERIMENTS:

1. Implement DDA Line Drawing algorithm
2. Implement Bresenham's line drawing algorithm.
3. Implement Mid-Point circle drawing algorithm.
4. Implement Mid-Point ellipse drawing algorithm.
5. Implement cubic Bezier curve.
6. Implement a menu-driven program for 2D transformations.
7. Implement Line clipping algorithm using Cohen-Sutherland.
8. Implement Polygon Clipping using Sutherland Hodgeman.
9. Implement Scan line fill algorithm.
10. Study of Multimedia and Program for Flash.

S.8 CYBER AND NETWORK SECURITY (BTIT-603)

UNIT-I

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security mechanism, Fundamental Security Design Principles, Attack Surface and Attack trees, A Model for Network Security. Introduction to Cyber crime, Cyber crime and Information Security, Classification of Cyber crimes, Cyber crime: The Legal Perspective, Cyber crime: An Indian Perspective.

UNIT-II

Introduction to Cyber offence, How Criminal plan the attack, Social Engineering, Cyber stalking, Cyber café and cyber crime, Botnets: The fuel of cybercrime, Attack vector, cloud computing. Cyber crime: Mobile and Wireless devices, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Setting for Mobile Devices, Authentication Service Security, Attack on Mobile Phones.

UNIT-III

Tools and Methods Used in Cyber crime, Proxy Server and Anonymizers, Phishing and Identity Theft, Password Cracking, Keylogger and Spyware, Virus and Worms, Trojan Horse and Backdoors, Steganography DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attack on Wireless Networks.

UNIT-IV

Cyber crime and the Legal Landscape around the World, Why Do We Need Cyber laws, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Information Technology Act, Digital Signature and the IT Act, Cybercrime and Punishment. Introduction to Cyber Forensics, Historical Background of Cyber Forensics, Cyber Forensics and Digital Evidence, Forensic Analysis of E-Mail, Digital Forensic Life Cycle, Approaching Computer Forensic Investigation, Relevance of OSI Model to Computer Forensic, Challenges in Computer Forensic.

UNIT-V

Network Access Control and Cloud Security, Transport- Level Security, Wireless Network Security, Electronic Mail Security, IP Security.

TEXT BOOKS:

1. William Stallings, “Cryptography and Network Security: Principles and Practice”,7th Edition Pearson,2017
2. Sunit Belapure, Nina Godbole “Cyber Security”,1st edition, Wiley Publication, 2011

REFERENCES:

1. Carl Endorf, Eugene Schultz, Jim Mellander “Intrusion Detection& Prevention”,1st Edition, TMH,2007
2. Neal, Krawetz, Introduction to Network Security,1st Edition , Cengage Learning,2006
3. Atul Kahate, ”Cryptography and Network Security”, McGraw Hill,,2009
4. Charlie Kaufman, Radia Perlman, Mike Speciner, Michael Speciner, “ Network Security - Private communication in a public world” ,2nd Edition, TMH,2002
5. Fourozon, “Cryptography & Network Security” 4th Edition , TMH,2005
6. Mayank Bhushan “Fundamentals of Cyber Security”,1st Edition , BPB Publication,2017
7. Gaurav Gupta,Sarika Gupta “Information Security and Cyber Laws”,1st Edition, Khanna Book Publishing, 2011.

LIST OF PRACTICALS: At least ten practical based on the syllabus.

S.9 DISTRIBUTED SYSTEM (BTIT-713)

UNIT-I INTRODUCTION

Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT-II COMMUNICATION IN DISTRIBUTED SYSTEM

System Model, Interprocess Communication, API for internet protocols, External data representation and Multicast communication, Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation and Objects: Remote Invocation, Introduction requestreply protocols, Remote procedure call, Remote method invocation, Case study: Java RMI – Group communication, Publish-subscribe systems, Message queue, shared memory approaches Distributed objects, Case study: Enterprise Java Beans -from objects to components.

UNIT-III PEER TO PEER SERVICES AND FILE SYSTEM

Peer-to-peer Systems Introduction, Napster and its legacy, Peer-to-peer Middleware, Routing overlays. Overlay case studies: Pastry, Tapestry, Distributed File Systems, File service architecture, Andrew File system. File System: Features-File model -File accessing models, File sharing semantics Naming: Identifiers, Addresses, Name Resolution, Name Space Implementation, Name Caches LDAP.

UNIT-IV SYNCHRONIZATION AND REPLICATION

Introduction Clocks, events and process states ,Synchronizing physical clocks, Logical time and logical clocks , Global states , Coordination and Agreement, Distributed mutual exclusion, Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control – Timestamp ordering – Atomic Commit protocols - Distributed deadlocks – Replication – Case study – Coda.

UNIT-V PROCESS & RESOURCE MANAGEMENT

Process Management: Process Migration: Features, Mechanism, Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms, Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

TEXT BOOKS:

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.

REFERENCES:

1. Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.
2. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
3. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
4. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

LIST OF EXPERIMENTS:

1. Write a Program to implement Concurrent Echo Client Server Application.
2. Write the Programs for Remote Procedure call.
3. Write the Programs for Remote Method Invocation.
4. Write the Programs for Thread Programming in JAVA.
5. Implement CORBA file.
6. Write a Program to Increment a Counter in Shared Memory.
7. Implement Network File System (NFS).
8. Creation of a BPEL (Business Process Execution Language) Module and a Composite Application.

- 9. Study of Web Service Programming.**
- 10. Study of Grid Services using various Tools.**
- 11. Simulate election algorithms.**
- 12. Simulate clock synchronization algorithm.**
- 13. Simulate Distributed Deadlock Detection algorithm.**

S.10 Artificial Intelligence (BTCS-511)

UNIT-I Introduction:

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT-II Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search. **UNIT-III**

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networksrepresentation, construction and inference, temporal model, hidden Markov model.

UNIT-IV Markov Decision process:

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT-V Reinforcement Learning:

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 3rd Edition, Prentice Hall.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill.
3. Trivedi, M.C., “A Classical Approach to Artifical Intelligence”, Khanna Publishing House, Delhi.
4. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011.
5. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010.

WEBSITES FOR REFERENCE:

1. <https://nptel.ac.in/courses/106105077>
2. <https://nptel.ac.in/courses/106106126>
3. <https://aima.cs.berkeley.edu>
4. https://ai.berkeley.edu/project_overview.html (for Practicals)

LIST OF PRACTICALS:

1. Write a programme to conduct uninformed and informed search.
2. Write a programme to conduct game search.
3. Write a programme to construct a Bayesian network from given data.
4. Write a programme to infer from the Bayesian network.

5. Write a programme to run value and policy iteration in a grid world.
6. Write a programme to do reinforcement learning in a grid world.
7. Mini Project work.

- Sem 6

S.1 Minor Project (BTCS-606)

Objectives/Learning Outcomes/Capability Development

Program Learning Outcomes

This course contributes to the following program learning outcomes:

- Enabling Knowledge:

You will gain skills as you apply knowledge with creativity and initiative to new situations. In doing so, you will:

Demonstrate mastery of a body of knowledge that includes recent developments in Information Technology

Recognize and use research principles and methods applicable to Information Technology.

- Critical Analysis:

You will learn to accurately and objectively examine, and critically investigate Information Technology (IT) concepts, evidence, theories or situations, in particular to:

analyze and model complex requirements and constraints for the purpose of designing and implementing software artifacts and IT systems

Evaluate and compare designs of software artifacts and IT systems on the basis of organizational and user requirements.

- Problem Solving: Your capability to analyze complex problems and provide suitable solutions will be extended as you learn to: design and implement software solutions that accommodate specified requirements and constraints, based on analysis or modeling or requirements specification.

- Communication: You will learn to communicate effectively with a variety of audiences through a range of modes and media, in particular to: interpret abstract theoretical propositions, choose methodologies, justify conclusions and defend professional decisions to both IT and non-IT personnel via technical reports of professional standard and technical presentations.

- Responsibility: You will be required to accept responsibility for your own learning and make informed decisions about judging and adopting appropriate behaviour in professional and social situations. This includes accepting the responsibility for independent life-long learning and a high level of accountability. Specifically, you will learn to: effectively apply relevant standards, ethical considerations, and an understanding of legal and privacy issues to designing software applications and IT systems.

- Research and Scholarship: You will have technical and communication skills to design, evaluate, implement, analyze and theorize about developments that contribute to professional practice or scholarship; specifically you will have cognitive skills:

To demonstrate mastery of theoretical knowledge and to reflect critically on theory and professional practice or scholarship

To plan and execute a substantial research-based project, capstone experience and/or piece of scholarship.

Course Learning Outcomes Upon successful completion of this course you should be able to:

- Identify a task or problem relevant to /or IT
- Search and review of the relevant literature
- Propose a solution to the task or problem
- Develop a software and/or algorithmic solution to the task or problem
- Implement solutions to meet high quality requirements developed by the supervisor
- Carry out research under supervision
- Present the research in a written form like that used for published papers
- Present the research in an oral seminar.

Overview of Learning Activities

A Minor project is a substantial work of supervised research or software development. You will choose an academic staff member as your supervisor to work on a research project. To successfully complete the course, you must demonstrate research skills: ability to undertake research under supervision, ability to analyze, develop, and present the research in a written form like that used for published papers, and ability to present the research in an oral seminar. In this course, you are expected to carry out research activities including implementing a complete solution to the problems identified by the supervisor, critical analysis of results, and completing a written Project. The major deadline for this course is the delivery of the Minor Project by the end of the semester.

Overview of Assessment

You must satisfactorily complete each of the following assessment tasks for this course:

Research project comprising an implemented and critically analyzed solution to the task or problem

Written report (final Project) describing the problem, the relevant literature, the solution, and its relation to other work in the area

Seminar on your research (of 20 minutes) soon after your Project is submitted.

The Minor Project is assessed on its merits as a research publication. Each Project is examined by two academics, usually from within the Institute.

S.2 IT WorkshopSciLab/MATLAB (BTIT-608)

UNIT-I INTRODUCTION TO SIMULATION SOFTWARE:

**About SCILAB/MATLAB, SCILAB/MATLAB System, Starting and Quitting
SCILAB/MATLAB. EXPRESSIONS: Variables Numbers, Operators Functions, Expressions.**

UNIT-II FLOW CONTROL:

If, else, and else if, switch and case, for, while, continue, break try - catch, return. COMMAND WINDOW: The format Function, Suppressing Output, Entering Long Statements, Command Line Editing.

UNIT-III MATRICES AND ARRAYS:

Entering Matrices sum and transpose, subscripts, colon Operator, magic Function. WORKING WITH MATRICES: Generating Matrices, The load Function, M-Files, Concatenation, Deleting Rows and Columns, Linear Algebra, Arrays Multivariate Data, Scalar Expansion, Logical Subscripting, find Function.

UNIT-IV SCRIPTS & FUNCTIONS:

Scripts, Functions, Global Variables, Passing String Arguments to Functions, eval Function, Function Handles, Vectorization , Pre allocation. OTHER DATA STRUCTURE: Multidimensional Arrays, Cell Arrays, Characters and Text, Structures

UNIT-V GRAPHICS:

Plotting Process, Editing Process, Preparing Graphs, Basic Plotting Functions, Mesh & Surface Plot, and Image Reading & Writing, Printing graphics. SIMULINK

TEXT BOOKS & REFERENCES:

1. MATLAB and its Applications in Engineering, Rajkumar Bansal, Pearson Publishers, ISBN-10: 8131716813, 2009.
2. A Guide to MATLAB: For Beginners & Experienced Users By: Kevin R. Coombes, John E. Osborn, Garrett J. Stuck
3. SCILAB(a Free Software to Matlab),Er. HemaRamachandran and Dr. Achutsankar Nair, S. Chand Publishers, ISBN-10: 8121939704,2011
4. Introduction to SCILAB by Rachna Verma and Arvind Verma
5. SCILAB—A Beginner’s Approach by Anil Kumar Verma
6. <http://in.mathworks.com/>
7. <https://www.scilab.org/resources/documentation/tutorials>

LIST OF PRACTICALS:

1. Addition, subtraction and multiplication of two matrices.
2. Verify whether the given matrix is singular or non-singular and compute its inverse if applicable.
3. Sorting of 1-D array and searching of an array/matrix. Also, list the set of numbers that obey a common condition in an array/matrix using find().
4. Solve simultaneous equations (maximum of three) using Cramer’s rule. [Simultaneous equations may be obtained by applying KCL or KVL for a circuit and they can be solved for voltages or currents, respectively]
5. a) Show that $\log_{10}(A \cdot B) = \log_{10} A + \log_{10} B$ and $\log_{10}(A/B) = \log_{10} A - \log_{10} B$
b) Plot the voltage across capacitor during charging $V_c = V_0[1 - e^{-(t/RC)}]$
6. a) Plot a straight line for the given slope and intercept using different plot attributes.
b) Differentiate and integrate $y = mx + c$, separately, and display the results on the same plot.
7. Plot $y_1 = A \cdot \sin(2\pi f_1 t)$, $y_2 = B \cdot \cos(2\pi f_2 t)$ and $y_3 = A \cdot \sin(2\pi f_1 t) + B \cdot \cos(2\pi f_2 t)$, in time and frequency (after computing DFT or FFT) domains as subplots and infer the results.
8. Integrate and differentiate $\sin(x)$ and display the results on the same plot in different colors. Also display $\sin(x)$ on the same plot.
9. Compute mean, median, standard deviation and variance of a set of data using formulae and verify using built-in functions.
10. Find all the even and prime numbers between two numbers (range).
11. Demonstrate

- (a) reading and display image,
 - (b) converting color image to gray and blackand-white and plotting their histograms, and
 - (c) conversion of image file formats.
12. Compare the results of the built-in and user-defined function to compute $\cos(x)$ [the series $\cos(x)=1-(x^2/2!)+(x^4/4!)-(x^6/6!)+\dots$ can be used]
13. Write a program to compute roots of a quadratic equation $ax^2+bx+c=0$ given a , b and c .

S.3 Block Chain (BTCS-618)

UNIT-I Introduction:

Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block chain. Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.

UNIT-II Understanding Block chain with Crypto currency:

Bitcoin and Block chain: Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.

UNIT-III Understanding Block chain for Enterprises:

Permissioned Block chain: Permissioned model and use cases, Design issues for Permissioned block chains, Execute contracts, State machine replication, Overview of Consensus models for permissioned block chain- Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem, Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.

UNIT-IV Enterprise application of Block chain:

Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Block chain, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain.

UNIT-V Block chain application development:

Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric, Writing smart contract using Ethereum, Overview of Ripple and Corda.

TEXT BOOKS:

1. Melanie Swan, —Block Chain: Blueprint for a New Economy, O'Reilly, 2015

2. Josh Thompsons, —**Block Chain: The Block Chain for Beginners- Guide to Block chain Technology and Leveraging Block Chain Programming!**.
3. Daniel Drescher, —**Block Chain Basics**, Apress; 1st edition, 2017.
4. Anshul Kaushik, —**Block Chain and Crypto Currencies**, Khanna Publishing House, Delhi.
5. Imran Bashir, —**Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained**, Packt Publishing.
6. Ritesh Modi, —**Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain**, Packt Publishing.
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O’Dowd, Venkatraman. Ramakrishna, —**Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer**, Import, 2018

LIST OF PRACTICALS:

5. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on Cloud to run.

<https://github.com/hyperledger/><https://docs.docker.com/getstarted/>https://console.ng.bluemix.net/docs/services/block_chain/index.html

https://console.ng.bluemix.net/docs/containers/container_index.html#container_index

2. Create and deploy a block chain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chaincode, and perform invoke and query on your block chain network <https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-using-fabric-sdkjava/>

3. Interact with a block chain network. Execute transactions and requests against a block chain network by creating an app to test the network and its rules.

<https://developer.ibm.com/patterns/interacting-with-a-block-chain-network/>

4. Deploy an asset-transfer app using block chain. Learn app development within a Hyperledger Fabric network.

<https://developer.ibm.com/patterns/deploy-an-asset-transfer-app-using-block-chain/>

5. Use block chain to track fitness club rewards Build a web app that uses Hyperledger Fabric to track and trace member rewards.

<https://developer.ibm.com/patterns/fitness-club-rewards-points-iot-and-retail-integration/>

6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Block chain Starter Plan. Use Hyperledger Fabric to invoke chaincode while storing results and data in the starter plan.

<https://developer.ibm.com/patterns/car-auction-network-hyperledger-fabric-node-sdk-starterplan/>

7. Develop an IoT asset tracking app using Block chain. Use an IoT asset tracking device to improve a supply chain by using Block chain, IoT devices, and Node-RED.

<https://developer.ibm.com/patterns/develop-an-iot-asset-tracking-app-using-block-chain/>

8. Secure art using block chain digital certificates. Node.js-based auction application can help democratize the art market <https://developer.ibm.com/patterns/securing-art-using-block-chain-digital-certificates/>

9. Mini projects such as :

(i) Block chain for telecom roaming, fraud, and overage management. See how communication service providers use block chain to enhance their value chains.

<https://developer.ibm.com/patterns/blockchain-for-telecom-roaming-fraud-andoveragemanagement/>

(ii) Use IoT dashboards to analyze data sent from a Block chain network. Build an IoT app and IoT dashboards with Watson IoT Platform and Node-RED to analyze IoT data

sent from a Block chain network. <https://developer.ibm.com/patterns/iot-dashboards-analyze-data-block-chain-network/>

(iii) Create an Android app with Block chain integration. Build a Block chain enabled health and fitness app with Android and Kubernetes.

<https://developer.ibm.com/patterns/create-an-android-app-with-block-chain-integration/>

(iv) Create a global finance block chain application with IBM Block chain Platform Extension for VS Code. Develop a Node.js smart contract and web app for a Global Finance with block chain use case <https://developer.ibm.com/patterns/global-financing-use-case-for-block-chain/>

(v) Develop a voting application using Hyperledger and Ethereum. Build a decentralized app that combines Ethereum's Web3 and Solidity smart contracts with Hyperledger's hosting Fabric and Chaincode EVM <https://developer.ibm.com/patterns/voting-app-hyperledger-ethereum/>

(vi) Create a block chain app for loyalty points with Hyperledger Fabric Ethereum Virtual Machine. Deploy Fabric locally with EVM and create a proxy for interacting with a smart contract through a Node.js web app <https://developer.ibm.com/patterns/loyalty-points-fabric-evm/>

S.4 Robotics (BTCS-617)

UNIT-I Introduction to Robotics:

Types and components of a robot, Classification of robots, closedloop and open-loop control systems. Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT-II Robot Kinematics and Dynamics:

Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT-III Sensors and Vision System:

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity /Affine/Projective transformations. Vision applications in robotics.

UNIT-IV Robot Control:

Basics of control: Transfer functions, Control laws: P, PD, PID. Non-linear and advanced controls.

UNIT-V Robot Actuation Systems:

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

TEXT BOOKS:

1. Saha, S.K., —Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., —Robotics, Oxford, New Delhi, 2006.
3. Niku Saeed B., —Introduction to Robotics: Analysis, Systems, Applications, PHI, New Delhi.
4. Mittal R.K. and Nagrath I.J., —Robotics and Control, Tata McGraw Hill.
5. Mukherjee S., —Robotics and Automation, Khanna Publishing House, Delhi.
6. Craig, J.J., —Introduction to Robotics: Mechanics and Control, Pearson, New Delhi, 2009
7. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, —Robot Modelling and Control, John Wiley and Sons Inc, 2005
8. Steve Heath, —Embedded System Design, 2nd Edition, Newnes, Burlington, 2003.
9. Merzouki R., Samantaray A.K., Phatak P.M. and Bouamama B. Ould, —Intelligent Mechatronic System: Modeling, Control and Diagnosis, Springer.

LIST OF PRACTICALS:

1. Study components of a real robot and its DH parameters.
2. Forward kinematics and validate using a software (Robo Analyser or any other free software tool).
3. Inverse kinematics of the real robot and validation using any software.
4. Use of open source computer vision programming tool openCV.
5. Image Processing using openCV.
6. Image Processing for color/shape detection.
7. Positioning and orientation of robot arm.
8. Control experiment using available hardware or software.
9. Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
10. Project work

S.5 Software Testing and Quality Assurance (BTCS-613)

UNIT-I BASIC CONCEPTS:

Basic Testing Vocabulary, Quality Assurance versus Quality Control, The Cost of Quality, Software Quality Factors, Software Defect, The Multiple Roles of the Software Tester(People Relationships), Scope of Testing, Testing Constraints, Various software development Life cycles (SDLC), Independent Testing, QA Process, Levels of Testing, The —V Concept of Testing.

UNIT-II WHITE BOX TESTING:

White box testing techniques - Statement coverage - Branch Coverage - Condition coverage - Decision/Condition coverage - Multiple condition coverage - Dataflow coverage - Mutation testing - Automated code coverage analysis.

UNIT-III BLACK BOX TESTING:

Black box testing techniques - Boundary value analysis - Robustness testing - Equivalence partitioning - Syntax testing - Finite state testing - Levels of testing – Unit testing- Integration Testing

UNIT-IV SYSTEM TESTING –

Functional testing-non-Functional testing-acceptancetestingperformance testing –Factors and Methodology for Performance testing, Regression testingMethodology for Regression-testing.Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors, Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, Quality Characteristics, Software Quality Standard

UNIT-V ADVANCE SOFTWARE TESTING METHOD (OBJECT ORIENTED TESTING):

Syntax testing - Finite State testing - Levels of testing - Unit, Integration and System Testing. Challenges - Differences from testing non-OO Software - Class testing strategies - State-based Testing Software quality Assurance: ISO 9000; CMM and Test Management Issues; Quality Assurance personnel Issues.

TEXT BOOKS:

1. KshirasagarNaik&PriyadarshiTripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,Software Enginerring, TMH
4. Sommerville,Software Enginerring,Pearson Education.
- 5.—IBM CE-Enablement Program- Essentials of Software Engineering (OOAD & SW Lifecycle), IBM Careere Education

REFERENCES:

1. KshirasagarNaik&PriyadarshiTripathy, —Software Testing & Quality Assurance, A JOHN WILEY & SONS, INC. Publication.
2. R S. Pressman ,Software Engineering: A Practitioner's Approach, Sixth edition 2006, McGraw-Hill.
3. Waman S.Jawadekar,Software Enginerring, TMH
4. Sommerville,Software Enginerring,Pearson Education.
5. <http://www.softwaretestinghelp.com/online-software-testing-course-syllabus/>
6. <https://amizone.net/AdminAmizone/WebForms/Academics/NewSyllabus/1217201473127725.pdf>
7. <http://www.tutorialspoint.com/uml/>

LIST OF EXPERIMENTS:

1. Design test cases using Boundary value analysis by taking quadratic equation problem.
2. Design test cases using Equivalence class partitioning taking triangle problem.
3. Design test cases using Decision table taking triangle problem.
4. Design independent paths by calculating cyclometer complexity using date problem.
5. Design independent paths by taking DD path using date problem.
6. Design the test cases for login page of AMIZONE.
7. Manual Testing for PAN card verification.
8. Generate test case for ATM machine.
9. Overview of Testing process using Rational Robot.
10. Write a script to record verification point using Rational Robot (For GUI testing of single click on window OS).

11. Write a script to record verification point for Clip Board and alphanumeric values using Rational Robot.

S.6 Simulation and Modeling (BTCS-612)

UNIT-I INTRODUCTION

Introduction to simulation & modeling, advantages and disadvantages of simulation, application areas in communication, computer and software design, systems and systems environment, components of a system, discrete and continuous systems, model of a system, types of models, discrete-event simulation, steps in a simulation study. Simulation Examples- Simulation of queueing systems, on-demand and inventory systems, simulation for reliability analysis, Introduction to GPSS.

UNIT-II COMPUTER BASED SYSTEM SIMULATION:

Types of System Simulation, Monte Carlo Method, comparison of analytical and Simulation methods, Markov Model, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

UNIT III INTRODUCTION TO QUEUING THEORY

Characteristics of queuing system, Poisson's formula, birth-death system, equilibrium of queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system, FSM, Petri-net Model.

UNIT-IV VERIFICATION AND VALIDATION

Verification of Simulation Models, Calibration and Validation of Models, Validation of Model Assumptions , Validating Input & Output Transformations, Design of simulation experiments,

UNIT-V SIMULATION TOOLS Simulation Tools –

Model Input – High level computer system simulation – CPU – Memory, Simulation – Comparison of systems via simulation – Simulation Programming techniques, Development of Simulation models, General Purpose Simulation Package-MATLAB, ARENA, EXTEND, Study of SIMULA, DYNAMO

TEXT BOOKS:

- 1 Gordon G., System simulation, PHI Learning
- 2.Singh V.P System Simulation and Modeling NEW AGE INTERNATIONAL, PUBLISHERS
- 3.Taha H, Operations Research; PHI.
- 4.Payer, T., Introduction to system simulation, McGraw Hill.
- 5.Spriet JA; Computer Aided Modeling and Simulation, Academic Press INC; USA

REFERENCES:

1. J K Sharma, Operations Research Theory and Application, Pearson Education Pvt Ltd, 2 Edition Banks J; Hand book of Simulation; John Wiley.
- 2.Law AM and Kelton WD; Simulation Modeling and Analysis; TMH

LIST OF EXPERIMENTS:

1. Simulate CPU scheduling algorithm using queueing system.
2. Simulate multiplexer using queuing system.
3. Simulate Network congestion control algorithms using Petri-net Model.
4. Simulate disk scheduling algorithms Petri-net Model.
5. Verification and validation of Petri-net Model.
6. Simulate a Manufacturing shop and write a program in GPSS.
7. Simulate Telephone system model and write a program in SIMSCRIPT.
8. Graphical Simulation and Modeling using MATLAB.
9. Study of SIMULA.
10. Study of DYNAMO.

S.7 Cloud Computing (BTCS-701)

UNIT-I:

Overview of Cloud Computing Introduction- Evolution, Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment, Advantages, Service & Deployment Models, Infrastructure, and Consumer View, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

UNIT-II :

Cloud Computing Technology Client systems, Networks, server systems and security from services perspectives, security and privacy issues; accessing the cloud with platforms and applications; Cloud storage

UNIT-III:

Working with Cloud Infrastructure as a Service – conceptual model and working, Platform as a Service – conceptual model and functionalities. Software as a Service –conceptual model and working. Trends in Service provisioning with clouds. Working on Microsoft Azure & IBM Smart Cloud.

UNIT-IV:

Using Cloud Services Cloud collaborative applications and services – case studies with calendars, schedulers and event management; cloud applications in project management. Amazon Web Services & applications, AWS EC2, S3, Cloud Analytics, Cloud Open Stack

UNIT-V:

Case studies- Microsoft Azure, Google App Engine, IBM Smart Cloud and Open source clouds,- Open-Nebula, Sales force and Eucalyptus, Cloud Simulation

TEXT BOOKS:

1. **Cloud Computing: A Practical Approach** by Anthony T. Velte J. Velte, RobertElsenpeter, 2010 by The McGraw-Hill.
2. Buyya, Selvi ,| Mastering Cloud Computing —,TMH Pub.
3. Michael Miller, **Cloud computing – Web based Applications**, Pearson Publishing, 2011

REFERENCES:

1. Kumar Saurabh, —Cloud Computing‖, Wiley Pub,2012.
2. Krutz , Vines, —Cloud Security , Wiley Pub,2013.
3. Sosinsky, — Cloud Computing‖, Wiley Pub,2012.
4. Murray Woodside; John Chinneck ; Marin Litiou on —Adaptive Cloud Deployment Using Persistence Strategies and Application Awareness‖IEEEExplore, Year: 2017, Page(s):277 – 290.

LIST OF EXPERIMENTS:

1. Service deployment & Usage over cloud using Virtual Box.
2. Performance evaluation of services over cloud using VMware tool.
3. Working of Goggle Drive to make spreadsheet.
4. Working on Heroku for Cloud application deployment.
5. Working on Aneka sevices for Cloud application.
6. Working on services of Google App Engine.
7. Working on Application deployment & services of Microsoft Azure.
8. Working on Application deployment & services of IBM Smart Cloud.
9. Working and configuration of Eucliptus.
10. Deployment & Services of Amazon Web Services.

S.8 Internet of Things (BTCS-602)

UNIT-I Introduction to IoT:

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology FundamentalsDevices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT-II Elements of IoT:

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

UNIT-III IoT Application Development:

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration.

UNIT-IV Device data storage:

Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT-V IoT Case Studies:

IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

TEXT BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, **Internet of Things**, “A Hands on Approach”, University Press.
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs.
3. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press
4. Jeeva Jose, “Internet of Things”, Khanna Publishing House, Delhi.
5. Adrian McEwen, “Designing the Internet of Things”, Wiley.
6. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill.
7. Cuno Pfister, “Getting Started with the Internet of Things”, O Reilly Media.

LIST OF PRACTICALS:

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/‘0’ is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
15. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

S.9 Data Science (BTCS-608)

UNIT-I Introduction to Data Science:

Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

UNIT-II Introduction to Programming Tools for Data Science:

Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplots, Working with data: Reading Files, Scraping the Web, Using APIs

(Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

UNIT-III Mathematical Foundations:

Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, Phacking, Bayesian Inference

UNIT-IV Machine Learning: Overview of Machine learning concepts –

Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time SeriesLinear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning And Generalization, Overview of Deep Learning.

UNIT-V Case Studies of Data Science Application:

Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOKS & REFERENCES:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media.
2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media.
3. Jain V.K., "Data Sciences", Khanna Publishing House, Delhi.
4. Jain V.K., "Big Data and Hadoop", Khanna Publishing House, Delhi.
5. Jeeva Jose, "Machine Learning", Khanna Publishing House, Delhi.
6. Chopra Rajiv, "Machine Learning", Khanna Publishing House, Delhi.
7. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press
<http://www.deeplearningbook.org>
8. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers

LIST OF PRACTICALS:

1. Write a programme in Python to predict the class of the flower based on available attributes.
2. Write a programme in Python to predict if a loan will get approved or not.
3. Write a programme in Python to predict the traffic on a new mode of transport.
4. Write a programme in Python to predict the class of user.
5. Write a programme in Python to indentify the tweets which are hate tweets and which are not.
6. Write a programme in Python to predict the age of the actors.
7. Mini project to predict the time taken to solve a problem given the current status of the user.

UNIT-I Introduction:

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

UNIT-II Regular Expression (RE):

Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT-III Context Free Grammar (CFG) and Context Free Languages (CFL):

Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT-IV Push Down Automata (PDA):

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT-V Turing machines (TM):

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to undecidability, undecidable problems about TM, NP hard and NP complete problem, Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

TEXT BOOKS:

1. Hopcroft and Ullman, —Introduction to Automata Theory, Languages and Computation||, Pearson Education, 3rd edition, 2014
2. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Pub.House, 2011.
3. K.L.P Mishra & N.Chandrasekaran,—Theory of Computer Science||, PHI Learning, 3rd edition, 2006

REFERENCES:

1. Martin J. C., —Introduction to Languages and Theory of Computations||, TMH, 4th edition, 2010.
2. Papadimitriou, C. and Lewis, C. L., —Elements of the Theory of Computation||, PHI, 1997.
3. Michael Sipser,—Introduction to Theory of Computation||, Cengage Learning, 3rd edition, 2013.

- Sem 7

S.1 Next Generation Telecommunication Networks (BTCC-703)

UNIT-I

Basic history of Mobile Computing Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing through internet, Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing.

UNIT-II

Next Generation Networks (NGN), Principles and definition of an NGN, The NGN architecture, Outline of technology choices, Network and implementation issues with NGN, Numbering & Addressing

UNIT-III

Wireless n/w. and Technologies Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G, Bluetooth, Radio frequency identification(Rfid),Wireless Broadband, Mobile IP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction oriented TCP. ,IPv6

UNIT-IV

Next Generation Core NetworkThe role of the core network, Enabling Control and Reconfigurability, Packet Switching (ATM, IP, MPLS, Ethernet), IP Multi-Media System (IMS), Principles of control for IP networks, Concept of IMS UNIT-V NGN Service AspectsServices on an NGN, Service compatibility with PSTN and IN, Use of APIs and service provider interfaces, Brief review of the principles of mobile networks, Relationship of mobile developments to NGN

TEXT BOOKS

1. VALDAR, A R: 'Understanding Telecommunications Networks', IET Telecommunications Series 52, 2006
2. Convergence Technologies for 3G Networks: IP, UMTS, EGPRS and ATM Authors: Jeffrey Bannister, Paul Mather, and Sebastian Coope. . John Wiley & Sons, Ltd. ISBN 0-470-86091-X (HB)
3. Mobile Computing , Asoke K Telukder, Roopa R Yavagal, TMH
4. Wireless Communications and Networks, 3G and beyond, ITI SahaMisra, TMH

REFERENCES

1. M Carugi "Introduction to the ITU-T NGN focus group release 1: target environment, services, and capabilities," Communications Magazine, IEEE, vol.43, no.10, pp. 42- 48, Oct. 2005
2. Chae-Sub Lee, Knight, D. , "Realization of the next-generation network," Communications Magazine, IEEE, vol.43, no.10, pp. 34- 41, Oct. 2005.

S.2 Soft computing (BTCS-711)

UNIT-I

Introduction to Soft Computing, Historical Development, Definitions, advantages and disadvantages, solution of complex real life problems, Soft Computing and its Techniques, Soft Computing verses Hard Computing. Applications of Soft Computing in the Current industry.

UNIT-II

Introduction to Fuzzy Logic, Crisp Sets, Fuzzy Sets, Fuzzy Relations, Membership Functions and features, Fuzzification, Methods of Membership Value Assignments, Defuzzification and methods, Lambda cuts. Fuzzy Measure, Fuzzy Reasoning, Fuzzy Inference System.

UNIT-III

Neural Network (NN), Biological foundation of Neural Network, Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back-propagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network

UNIT-IV

Genetic Algorithm, Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

UNIT-V

Neuro-Fuzzy and Soft Computing, Adaptive Neuro-Fuzzy Inference System Architecture, Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN. Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. Hybridization of other techniques.

TEXT BOOKS

1. S.N. Deepa and S.N. Sivanandam, **Principles of Soft Computing**, 2ed., Wiley, 2011
2. Vojislav Kecman, **Learning and Soft Computing - Support Vector Machines, Neural Networks, and Fuzzy Logic Models**, 1ed., The MIT Press, 2001.
3. D. K. Pratihar, **Soft Computing**, 1ed., Alpha Science, 2007.
4. Timothy J. Ross, **Fuzzy logic with Engineering Applications**, 3ed., John Wiley and Sons, 2010.
5. S. Rajasekaran and G.A.V. Pai, **Neural Networks, Fuzzy Logic and Genetic Algorithms**, 2ed. PHI
6. David E. Goldberg, **Genetic Algorithms in search, Optimization & Machine Learning**, 1ed., Addison-Wesley Publishing Company, 1989

REFERENCES

1. Jang, Sun and Mizutani, **Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence**, 1ed., Pearson, 1997.

2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, 1ed., Prentice Hall, 1995
 3. Simon Haykin, Neural Networks: A Comprehensive Foundation, 2ed. Prentice Hall, 1998
 4. Samir Roy and UditChakraborty, A Beginners Approach to Soft Computing, 1ed., Pearson, 2013
- S.3 Quantum Computing (BTCS-715)

UNIT-I Introduction to Quantum Computing:

Motivation for studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.), Origin of Quantum Computing, Overview of major concepts in Quantum Computing: Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement.

UNIT-II Math Foundation for Quantum Computing:

Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT-III Building Blocks for Quantum Program:

Architecture of a Quantum Computing platform, Details of q-bit system of information representation: Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from quantum algorithmic perceptive e.g. Bell State, Operation on qubits: Measuring and transforming using gates, Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlledgates, Ising, Deutsch, swap etc, Programming model for a Quantum Computing Program: Steps performed on classical computer, Steps performed on Quantum Computer, Moving data between bits and qubits.

UNIT-IV Quantum Algorithms:

Basic techniques exploited by quantum algorithms, Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum Walks, Major Algorithms: Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch -Jozsa Algorithm,

UNIT-V OSS Toolkits for implementing Quantum program:

IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)

TEXT BOOKS & REFERENCES:

1. Michael A. Nielsen, “Quantum Computation and Quantum Information”, Cambridge University Press.
2. David McMahon, “Quantum Computing Explained”, Wiley.
3. IBM Experience: <https://quantumexperience.ng.bluemix.net>
4. Microsoft Quantum Development Kit <https://www.microsoft.com/en-us/quantum/development-kit>
5. Forest SDK PyQuil: <https://pyquil.readthedocs.io/en/stable/>

S.4 Virtual Reality (BTCS-716)

UNIT-I Introduction to Virtual Reality:

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark. **3D Computer Graphics:** Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

UNIT-II Geometric Modelling:

Geometric Modelling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation. **Geometrical Transformations:** Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection. **Generic VR system:** Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

UNIT-III Virtual Environment:

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system. **Physical Simulation:** Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT-IV VR Hardware and Software: Human factors:

Introduction, the eye, the ear, the somatic senses. **VR Hardware:** Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. **VR Software:** Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

UNIT-V VR Applications:

Introduction, Engineering, Entertainment, Science, Training. The Future: Virtual environment, modes of interaction

TEXT BOOKS & REFERENCES:

1. John Vince, “Virtual Reality Systems”, Pearson Education Asia, 2007.
2. Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.
3. Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Inter Science, 2nd Edition, 2006.
5. William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application and Design”, Morgan Kaufmann, 2008.
6. www.vresources.org
7. www.vrac.iastate.edu
8. www.w3.org/MarkUp/VRM

S.5 OBJECT ORIENTED ANALYSIS AND DESIGN (BTIT-604)

UNIT-I Introduction:

About Object Oriented Technology, Development and OO Modeling History. Modeling Concepts: Modeling design Technique, Three models, Class Model, State model and Interaction model.

UNIT-II Class Modeling:

Object and class concepts, link and association, Generalization and Inheritance, Advanced class modeling- aggregation, Abstract class meta data, constraints. State Modeling: Event, state, Transition and conditions, state diagram, state diagram behavior, concurrency, Relation of Class and State models. Interaction Modeling: Use case Models, sequence models, activity models

UNIT-III Analysis and Design:

Development Life cycle, Development stages, Domain Analysis-Domain class model, domain state model, domain interaction model, Iterating and analysis. Application Interaction model, Application class model, Application state Model, Adding operation.

UNIT-IV System Design:

Estimating Performance, Making a reuse plan, breaking system into sub systems identifying concurrency, allocation of subsystems, management of data storage, Handling Global resources, choosing a software control strategy, Handling boundary condition, common Architectural style.

UNIT-V Class design:

Overview of class design, designing algorithms recursing downward, refactoring, design optimization, Adjustment of Inheritance, Rectification of Behavior.

TEXT BOOKS:

S.8 Michael Blaha and J. Rumbugh, “Object oriented Modeling and design with UML”, Pearson Education

REFERENCES:

1. Satzinger, Jackson and Burd, “Object oriented Analysis and design with the Unified Process”, CENGAGE Learning.
2. O’Docherty, “Object Oriented Analysis and Design Understanding, System Development with UML2.0”, Wiley India.

LIST OF EXPERIMENTS

1. How to write a Problem Statement
2. Perform the system analysis: Requirement analysis, SRS.
3. Perform the function oriented diagram: DFD and Structured chart.
4. Perform the user’s view analysis: Use case diagram.
5. Draw the structural view diagram: Class diagram, object diagram.
6. Draw the behavioral view diagram: Sequence diagram, Collaboration diagram.
7. Draw the behavioral view diagram: State-chart diagram, Activity diagram.
8. Draw the implementation view diagram: Component diagram.
9. Draw the environmental view diagram: Deployment diagram.

S.6 BIG DATA AND HADOOP (BTCS-702)

UNIT I

Introduction about big data ,Describe details Big data: definition and taxonomy , explain Big data value for the enterprise , Setting up the demo environment ,Describe Hadoop Architecture , Hadoop Distributed File System, MapReduce& HDFS , First steps with the Hadoop , Deep to understand the fundamental of MapReduce

UNIT II –

Hadoop ecosystem, Installing Hadoop Eco System and Integrate With Hive Installation, PigInstallation, Hadoop , Zookeeper Installation , Hbase Installation , Sqoop Installation, Installing Mahout Introduction to Hadoop , Hadoop components: MapReduce/Pig/Hive/HBase, Loading data into Hadoop, Getting data from Hadoop.

UNIT III

Using Hadoop to store data, Learn NoSQL Data Management, Querying big data with Hive, Introduction to the SQL Language , From SQL to HiveQL , Querying big data with Hive, Introduction to HIVE e HIVEQL, Using Hive to query Hadoop files. Moving the Data from RDBMS to Hadoop, Moving the Data from RDBMS to Hbase , Moving the Data from RDBMS to Hive UNIT IV Machine Learning Libraries for big data analysis, Machine Learning Model Deployment, Machine learning tools , Spark & SparkML , H2O , Azure ML.

UNIT V

Monitoring The HadoopCluster , Monitoring Hadoop Cluster, Monitoring Hadoop Cluster with Nagios, Monitoring Hadoop Cluster, Real Time Example in Hadoop , Apache Log viewer Analysis , Market Basket AlgorithmsBig Data Analysis in Practice , Case Study , Preparation of Case Study Report and Presentation , Case Study Presentation

Text Books:

1. Tom White," Hadoop: The Definitive Guide Paperback – 2015" Shroff Publishers & Distributers Private Limited - Mumbai; Fourth edition (2015).
2. V. K. Jain (Author)," Big Data and Hadoop" Khanna Publishers; 1 edition (1 June 2015)
3. Jason Bell (Author) "Machine Learning for Big Data: Hands-On for Developers and Technical Professionals" Wiley (2014)
4. Big Data Analytics &Hadoop by IBM ICE Publications

References:

1. **Big data. Architettura, tecnologie e metodi per l'utilizzo di grandi basi di dati, A. Rezzani, Apogeo Education, 2013**
2. **Hadoop For Dummies, Dirk deRoos, For Dummies, 2014**
3. **Cohen et al.“MAD Skills: New Analysis Practices for Big Data”, 2009**
4. **Ullman, Rajaraman, Mining of Massive Datasets, Chapter 2**
5. **Stonebraker et al., “MapReduce and Parallel DBMS’s: Friends or Foes?”, Communications of the ACM, January 2010.**
6. **Dean and Ghemawat, “MapReduce: A Flexible Data Processing Tool”, Communications of the ACM, January 2010.**

List of Practical's:

- 1. Installing Hadoop, configure HDFS, Install Zookeeper , Pig Installation, Sqoop Installation, Hbase Installation**
- 2. Configuring Hadoop**
- 3. Running jobs on Hadoop**
- 4. Working on HDFS 5. Hadoop streaming**

S.7 Human Values and Professional Ethics (BBAI-501)

Unit I: Human Value

- 1. Definition, Essence, Features and Sources**
- 2. Sources and Classification**
- 3. Hierarchy of Values**
- 4. Values Across Culture**

Unit II: Morality

- 1. Definition, Moral Behaviour and Systems**
- 2. Characteristics of Moral Standards**
- 3. Values Vs Ethics Vs Morality**
- 4. Impression Formation and Management**

Unit III: Leadership in Indian Ethical Perspective.

- 1. Leadership, Characteristics**
- 2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)**
- 3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).**

Unit IV: Human Behavior – Indian Thoughts

- 1. Business Ethics its meaning and definition**
- 2. Types, Objectives, Sources, Relevance in Business organisations.**
- 3. Theories of Ethics, Codes of Ethics**

Unit V: Globalization and Ethics

- 5. Sources of Indian Ethos & its impact on human behavior**
- 2. Corporate Citizenship and Social Responsibility – Concept (in Business),**
- 3. Work Ethics and factors affecting work Ethics.**

Suggested Readings

- 1. Beteille, Andre (1991). Society and Politics in India. AthlonePress:New Jersey.**
- 2. Chakraborty, S. K. (1999). Values and Ethics for Organizations. oxford university press**

3. Fernando, A.C. (2009). Business Ethics - An Indian Perspective .India: Pearson Education: India
 4. Fleddermann, Charles D. (2012). Engineering Ethics. New Jersey: Pearson Education / Prentice Hall.
 5. Boatright, John R (2012). Ethics and the Conduct of Business.Pearson. Education: New Delhi.
 6. Crane, Andrew and Matten, Dirk (2015). Business Ethics. Oxford University Press Inc:New York.
 7. Murthy, C.S.V. (2016). Business Ethics – Text and Cases. Himalaya Publishing House Pvt. Ltd:Mumbai
 8. Naag Rajan, R.R (2016). Professional Ethics and Human Values. New Age International Publications:New Delhi.
- S.8 Compiler Design (BTCS-601)

Unit – I: Introduction:

Compiler, Compilers analysis of the source program, Phases of a compiler, Cousins of the Compiler, Grouping of Phases and Compiler construction tools, Lexical Analysis, Role of Lexical Analyzer, Input Buffering and Specification of Tokens. Unit – II: Syntax Analysis: Role of the parser, Writing Grammars, Context-Free Grammars, Top Down parsing, Recursive Descent Parsing, Predictive Parsing, Bottom-up parsing, Shift Reduce Parsing, Operator Precedent Parsing, LR Parsers, SLR Parser – Canonical LR Parser – LALR Parser.

Unit – III: Intermediate Code Generation:

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Three Address code, Back patching, Procedure calls.

Unit – IV: Code Optimization and Run Time Environments:

Introduction, Principal Sources of Optimization, Optimization of basic Blocks, DAG representation of Basic Blocks - Introduction to Global Data Flow Analysis, Runtime Environments, Source Language issues, Storage Organization, Storage Allocation strategies, Access to non-local names, Parameter Passing, Error detection and recovery.

Unit – V: Code Generation:

Issues in the design of code generator, The target machine, Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information, A simple Code generator, Peephole Optimization.

Text Books:

1. Alfred V. Aho, Jeffrey D Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Asia, 2012
2. Jean Paul Tremblay, Paul G Serenson, "The Theory and Practice of Compiler Writing", BS Publications, 2005
3. Dhamdhere, D. M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008

References:

1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003
3. HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001
4. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

List of Experiments:

1. To study the Lex Tool.
2. To study the Yacc Tool.
3. Write a program to implement Lexical Analyzer to recognize few patterns of C.
4. Write a program to implement the Recursive Descent Parser.
5. Write a program to implement the Computation of FIRST and FOLLOW of variables of grammar.
6. Write a program to compute the leading and trailing symbols of grammar.
7. Write a program to implement Operator Precedence Parser.
8. Write a program to implement SLR parser.
9. Write a program to check the data types.
10. Write a program to implement the generation of three address code.
11. Write a program to implement the computation of postfix notation.
12. Write a program to implement the computation of Quadruple.