BACHELOR OF TECHNOLOGY

COMPUTER ENGINEERING

SYLLABI BOOK

B.Tech. Program

(For students admitted in July 2020 and after)

Department of Computer
Engineering Faculty of Technology
Dharmsinh Desai University
Nadiad – 387 001, Gujarat,
India.

http://www.ddu.ac.in

B. Tech. Semester I

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Mathematics I	3	1	0	4	4.0	60	40	-	-	100
Basic Electrical Engineering	3	1	2	6	5.0	60	40	50	-	150
Programming for Problem Solving I	4	0	3	7	5.5	60	40	50	-	150
Engineering Graphics & Design	1	0	4	5	3.0	-	-	100	-	100
Software Workshop	0	0	2	2	1.0	-	-	50	-	50
	11	2	11	24	18.5	180	120	250	-	550

B. Tech. Semester II

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Mathematics II	3	1	0	4	4.0	60	40	-	-	100
Programming for Problem Solving II	4	0	3	7	5.5	60	40	50	-	150
Physics	3	1	2	6	5.0	60	40	50	-	150
Hardware Workshop	0	0	4	4	2.0	-	-	100	-	100
English	2	0	2	4	3.0	40	-	50	-	90
Environmental Sciences	2	0	0	2	0.0	40	-	-	-	40
	14	2	11	27	19.5	260	120	250	-	630

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: MATHEMATICS - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	0	4	4	60	40	-	-	100

A. COURSE OBJECTIVE

The objective of this course is to familiarize the prospective engineers with techniques in calculus, matrices, vector spaces and multivariable calculus.

B. DETAILED SYLLABUS

[1] CALCULUS

Evolutes and involutes, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; indeterminate forms and L'Hospital's rule, Maxima and minima.

[2] MATRICES

Matrices, Vectors: addition and scalar multiplication, matrix multiplication; Rank of a Matrix, Linear systems of equations, Determinants, Cramer's Rule, Inverse of a matrix, Gauss Elimination and Gauss Jordan method.

[3] VECTOR SPACES

Eigenvalues, Eigenvectors, Symmetric, Skew-symmetric, and Orthogonal Matrices, Linear Independence of vectors, Diagonalization.

[4] MULTIVARIABLE CALCULUS (DIFFERENTIATION)

Limit, Continuity and Partial derivatives, Directional derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Vector Differential Calculus; Gradient, curl and divergence.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.
2) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
3) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4) D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
6) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th

Reprint,2010.

7) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
8) V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, AffiliatedEast–West press, Reprint 2005.

D. COURSE OUTCOMES

At the end of the course, student should be able to

- Solve engineering problems involving calculus, matrices and vector space.
- Use mathematical tools to solve problems in calculus, matrices and vector space.

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: BASIC ELECTRICAL ENGINEERING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	50*	-	150

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The course imparts an in-depth understanding of the fundamental concepts with an objective to expose the students to the various types of electrical, electronic and magnetic circuits and their applications. This course is designed to provide knowledge of fundamentals and various laws in electromagnetic and magnetic circuits, electrostatics.

B. DETAILED SYLLABUS

[1] DC CIRCUITS

Electrical circuit elements (R, L and C), impact of temperature, voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first order RL and RC circuits.

[2] AC CIRCUITS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections

[3] ELECTRO-MAGNETIC INDUCTION

Introduction, Magnetic effect of electric current, Current carrying conductor in magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance (L), Mutual Inductance (M), and Coupling coefficient between two magnetically coupled circuits (K), Inductances in series and parallel.

[4] MAGNETIC CIRCUITS

Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits

[5] TRANSFORMERS

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections

[6] ELECTRICAL MACHINES

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited

DC motor. Construction and working of synchronous generators, Construction, Principles and working theory and Types of DC Motors & Generators, 1-Ph & 3-Ph Induction Motor, AC Generator

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Basic Electrical, Electronics and Computer Engineering, R. Muthu Subramanian, S.Salivahanan, K. A. Muraleedharan, 2nd Edition, Tata McGraw Hill
2) Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill
3) Electrical Technology (Vol: II), B. L. Theraja , A. K. Theraja, 23rd Edition, R. Chand & Company
4) Basic Electrical Engineering, D.P. Kothari, I. J. Nagrath, 3rd Edition, Tata McGraw Hill
5) Introduction to VLSI Circuit & Systems, John P. Uyemura, 1st Edition, John Willey & Sons Inc.
6) Basic Electrical Engineering, D.C. Kulshreshtha, 1st Edition, Tata McGraw Hill
7) Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson
8) Electrical Engineering Fundamentals, V.D. Toro, 2nd Edition, Prentice Hall India
9) Fundamentals of Electrical Engineering, L.S. Bobrow, , Oxford University Press

D. COURSE OUTCOMES

At the end of the course, student should be able to

- Apply basic circuital laws (KVL, KCL and Ohm's) and Theorems (Thevenin's and Norton's) for simplifying the complex resistive network to compute node voltages and loop currents for given excitation.
- Analyze Single Phase AC Circuits, compute and demonstrate the waveforms and phasor diagram representation of alternating quantities.
- Design low pass, high pass, band pass and band elimination filter networks, analyze the frequency response of circuits to show the correlation between time domain and frequency domain response specifications.
- Analyze 3-Phase circuit (star-delta) and compute power for balanced and unbalanced load.
- Predict the behavior of any electrical and magnetic circuits with an ability to identify, formulate, and solve magnetic circuit problems in electrical machines
- Model the Equivalent Circuit of a Transformer for Performance Analysis
- Discriminate the constructional details, principle of operation and applications of AC and DC electrical machines.

B.TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: PROGRAMMING FOR PROBLEM SOLVING - I

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	3	7	5.5	60	40	50*	-	150

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objectives of teaching this course are:

- To impart in-depth understanding of fundamental programming concepts to build C programs.
- To explain conditional branching, iteration/looping, code reusability and pointers using C Programming Language.
- To demonstrate and teach how to code, document, test, and implement a well-structured C program.

B. DETAILED SYLLABUS

[1] OVERVIEW OF C

Basic structure of C program, compiling and running C program

[2] CONSTANTS, VARIABLES AND DATA TYPES

Types of constants, basic data types, identifier, variable, enum, symbolic constant, typedef, keywords, overflow and underflow

[3] OPERATORS AND EXPRESSIONS

Arithmetic, relational, logical, assignment, bitwise, and sizeof() operators, operator precedence and associativity, expression evaluation

[4] MANAGING INPUT OUTPUT OPERATIONS

getchar() and putchar() functions, formatted I/O using printf() and scanf()

[5] DECISION MAKING AND BRANCHING

if and if...else statement, nested and ladder if...else, conditional operator, switch statement, goto statement with warning

[6] DECISION MAKING AND LOOPING

while, do...while, and for loops, nested loops, break and continue statements

[7] ARRAYS AND STRINGS

Introduction to arrays, declaration, initialization and access of one-dimensional and two-dimensional arrays, Introduction to multi-dimensional and variable length arrays, declaration and initialization of strings, printing and scanning strings to/from standard I/O, string handling functions, list of strings

[8] USER-DEFINED FUNCTIONS

Function prototype and function declaration, function definition, function call, actual and

formal parameters/arguments, return type and return statement, Nested function call, recursion,scope, visibility, and lifetime of variables.

[9] STRUCTURES AND UNIONS

Defining structure, declaring and initializing structure variables, typedef, accessing structure members, copying and comparing structure variables, nested structures, arrays and structures,structures and functions, unions

[10] POINTERS

Introduction, accessing address of a variable, declaration and initialization of pointer variables, Accessing variable using pointer, chain of pointers, scale factor and pointer expressions, pointers and arrays, pointer to array Vs array of pointers, passing arrays and strings to the function, array of pointers, pointers and functions, pointers and structures, const pointer vs pointer to const

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Programming in ANSI C by Balagurusamy, 8th Ed., Tata McGraw Hill
2) Programming with C by Byron Gottfried, 3rd Ed., McGraw Hill Education
3) The C Programming Language by Kernighan and Ritchie, 2nd Ed., PHI Learning
4) Expert C Programming: Deep C Secrets by Peter Van Der Linden, Pearson Education
5) Let Us C by Yashvant Kanetkar, 12th Ed., BPB Publication
6) Programming in C by Ashok N. Kamthane, 2nd Ed., Pearson Education

D. COURSE OUTCOMES

At the end of the course, student should be able to

- Use and understand language syntax and concepts for C Programming.
- Comprehend and use C Programming concepts to solve algorithmic and logical problems.
- Analyze the given problem and to formulate appropriate C language solutions based on definitive language concept(s).
- Design a flowchart or a diagram for a given problem and create C programs using decision making, branching, looping, user defined function, array, structure, pointers, etc.
- Apply concepts to write, compile, debug, execute, and document C programs with different test cases using appropriate tool(s).

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: ENGINEERING GRAPHICS AND DESIGN

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
1	0	4	5	3	-	-	100*	-	100

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objectives of teaching this course are:

- To Understand the drawing importance in Engineering.
- To Describe the 3-Dimensional object into a different 2-Dimensional view.
- To Develop skills in Reading and Interpretation of Engineering Drawings.
- To enhance drawing skills through hands-on training in a CAD lab using engineering software.

B. DETAILED SYLLABUS

[1] Introduction to Engineering Drawing Covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales –Plain, Diagonal and Vernier Scales;

[2] Orthographic Projections Covering, Principles of Orthographic Projections- Conventions Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

[3] Projections of Regular Solids Covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

[4] Sections and Sectional Views of Right Angular Solids Covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid,Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

[5] Isometric Projections Covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice- versa, Conventions;

[6] Overview of Computer Graphics Covering, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software.

[7] Customization & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO andANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

[8] Annotations, layering & other Functions Covering applying dimensions to objects, applying

annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines(extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wire frame models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multi view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar PublishingHouse
2) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5) (Corresponding set of) CAD Software Theory and User Manuals

D. COURSE OUTCOMES

At the end of the course, student should be able to

- Skills in understanding and interpreting engineering drawings so that concepts can be communicated graphically more effectively.
- Demonstrate correct usage of methods, concepts, and theories to illustrate and solve problems of conics, lines, planes, solids, and surface and many more.
- Choose a suitable standard projection method, break down a complex 3D problem into various orthographic and sectional orthographic views, and highlight missing features.
- Practical Exposure in a computer aided software to generate isometric projection and compose standard components of different streams

B. TECH. SEMESTER – I (EC/CE/IT)

SUBJECT: SOFTWARE WORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	2	2	1	-	-	50*	-	50

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objective of the course is to familiarize students with various software tools and technology. The course aims at providing hands-on experience related to basic software installation, usage of Operating systems and various essential software utilities.

B. DETAILED SYLLABUS

[1] OPERATING SYSTEM BASICS

Introduction to Operating System and Linux Architecture

[2] SOFTWARE INSTALLATION

Installation of open source/freeware software using package manager for programming/simulation.

[3] SHELL COMMANDS

Linux usage, commands & shell scripting. Command structure and general purpose utility

[4] FILE HANDLING

Basic of file handling. The file system, Handling ordinary files, File attributes and permission,file system details

[5] SHELL SCRIPTING

Basic Shell commands, Looping and Branching,

[6] SHELL UTILITIES

Find command and shell, simple filters, advance filters.

[7] EDITORS

VI editor for basic text editing, LATEX for scientific documents and report writing.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Unix : Concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw Hill

D. COURSE OUTCOMES

After completing the course, the students will

- Have knowledge of installation and maintenance of softwares
- Be able to perform computational tasks using various utilities and commands related to operating systems
- Be able to manage and maintain software systems on a PC.

B. TECH. SEMESTER II (EC/CE/IT)

SUBJECT: MATHEMATICS-II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	0	4	4	60	40	0	0	100

A. COURSE OBJECTIVE

The objective of this course is to familiarize the prospective engineers with techniques in Differential Equations, numerical methods and laplace transform.

B. DETAILED SYLLABUS

[1] FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS AND INTRODUCTION TO HIGHER ORDER DIFFERENTIAL EQUATIONS

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, second order linear differential equations with variable coefficients, Method of variation of parameters, Cauchy-Euler equation.

[2] NUMERICAL METHODS

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods, Runge-Kutta method of fourth order for solving first order equations, Solution of algebraic and transcendental equations: Newton Raphson's Method, Numerical integration : Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

[3] MULTIVARIABLE CALCULUS (INTEGRATION)

Multiple Integration: Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Triple integrals (Cartesian), Scalar line integrals,Vector line integrals, Scalar surface integrals, Vector surface integrals, Theorems of Green, Gauss and Stoke's.

[4] LAPLACE TRANSFORM

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions, Finding inverse Laplace transform by different methods, Convolution theorem. Evaluation of integrals by Laplace transform, Solving ODE by Laplace Transform method.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007.
2) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Ed.,Pearson, 2002.
3) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4) W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary ValueProblems, 9th Edn., Wiley India, 2009.
5) S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
6) E. A. Coddington, An Intro. to Ordinary Differential Equations, Prentice Hall India, 1995.

7) J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- GrawHill, 2004.
8) N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

D. COURSE OUTCOMES

After completing the course, the students will

- Solve engineering problems involving differential equations, numerical methods and laplace transform.
- Use mathematical tools to solve problems in differential equations, numerical methods and laplace transform.

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: PROGRAMMING FOR PROBLEM SOLVING - II

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	3	7	5.5	60	40	50*	-	150

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objectives of teaching this course are:

- To provide fundamental concepts of object-oriented programming like abstraction, inheritance, polymorphism etc. and explain differences between object-oriented programming and procedural programming
- To teach programmatic implementation of these concepts using c++ language.
- Explain significance of these concepts to learn subjects like software engineering and object-oriented design and analysis.

B. DETAILED SYLLABUS

[1] BASICS OF C++

Overview, Program structure, keywords, identifiers, constants, data types, symbolic constants, declaration of variables, operators, namespaces, control structures, dynamic memory – C style – malloc(), calloc(), realloc() and free() Vs C++ style - new and delete keywords, reference and pointer

[2] FUNCTIONS IN C++

main function (variations in signature), function prototype, inline functions, call and return by reference, default parameters, function overloading

[3] INTRODUCTION TO OBJECT ORIENTED PROGRAMMING

Procedural Vs Object Oriented Programming, Principles of OOP, Benefits and applications of OOP

[4] CLASSES AND OBJECTS – ENCAPSULATION AND ABSTRACTION

Introduction, private and public members, Defining member functions, static members, Objects as function arguments and return type, friend functions, const member functions, Constructors and their types, Destructor, Operator overloading, type conversion

[5] INTRODUCTION TO C++ STRING CLASS

[6] INHERITANCE

Introduction, types of inheritance – single, multiple, multilevel, hierarchical, and hybrid inheritance, Protected members, overriding, virtual base class

[7] POLYMORPHISM

Introduction, Pointers and Objects, this pointer, pointer to derived classes, virtual and pure virtual functions, dynamic binding

[8] INPUT/OUTPUT

Introduction to streams, standard I/O stream objects, stream classes, unformatted and formatted I/O, manipulators

[9] EXCEPTION HANDLING

Basics of exception handling, try-catch-throw, rethrowing exceptions, user defined exceptions

[10] TEMPLATES

Basics of class templates and function templates

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Object-Oriented programming with C++, Seventh Ed., by E Balagurusamy, TMH publication
2) The C++ Programming Language, Fourth Ed., by Bjarne Stroustrup, Addison-Wesley Publication
3) Object-Oriented Programming in C++, Fourth Edition, by Robert Lafore, SAMS publication
4) Accelerated C++: Practical Programming by Example, First Edition, by Andrew Koenig andBarbara E. Moo, Addison-Wesley publication
5) C++ Black Book, First edition, by Steven Holzner, Paraglyph Press
6) C++: The Complete Reference, Fourth Edition, by Herbert Schildt, McGraw Hill Education

D. COURSE OUTCOME

At the end of the course students should be able to:

- Use and understand language syntax and concepts for C++ Programming along with templates for class and function.
- Apply Object Oriented Programming (OOP) concepts to solve algorithmic and logical problems.
- Identify the given problem and to formulate appropriate C++ language solutions based on OOP Principle(s).
- Write C++ programs using Encapsulation, Abstraction, Inheritance, Polymorphism, Exception Handling, etc. to solve given problem(s).
- Apply concepts to write, compile and execute C++ programs with different test cases. Also be able to debug and document C++ programs.

B. TECH. SEMESTER II (EC/CE/IT)

SUBJECT: PHYSICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	50*	-	150

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objective of this course is to relate the concept of physics with the ever-growing field of Information and Communication Technology. This course provides knowledge on the electronic devices such as Semiconductor Diodes: Bipolar Junction transistors, Amplifiers: Sinusoidal Oscillators: & build capability for designing various circuits of electronic devices. The course elaborates the concepts associated with Optoelectronics, Communication and Semiconductor switching devices. It also provides comprehensive ideas about analog modulation & demodulation techniques (AM, FM and PM) and digital modulation (ASK, FSK and PSK).

B. DETAILED SYLLABUS

[1] SEMICONDUCTORS

Intrinsic and extrinsic semiconductors, Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic & other devices.

[2] DIODE

Introduction to P-N junction Diode and V-I characteristics, Half wave and Full- wave rectifiers, capacitor filter. Zener diode and its characteristics, Zener diode as voltage regulator, Special purpose diodes.

[3] LIGHT-SEMICONDUCTOR INTERACTION

Radiative transitions and optical absorption, LED and LASER, Photo detectors.

[4] ACTIVE COMPONENTS AND APPLICATIONS

BJT: Structure and input-output characteristics of a BJT, The Unbiased Transistor, Transistor Currents , Biased Transistor, a single stage voltage divider biasing, Emitter Bias, The CE Connections, The Base Curve, Collector curve, Transistor approximation Variation in current Gain, The Load Line, The Operating point, Recognizing Saturation, BJT as a switch & Amplifiers, LED Drivers.

[5] OSCILLATORS

General form of oscillator, Sinusoidal oscillator, phase shift oscillator, Crystal Oscillator.

[6] MOSFET

MOS physics and mode of operations, nFET current-voltage relationship, MOS pass characteristics and CMOS inverter, Dynamic RAM (DRAM) 1T bit-cell.

[7] FIBER OPTICS

Fiber Optics and Optoelectronics, Historical Developments, A Fiber-Optic Communication System, Advantages of Fiber-Optic Systems, Ray Propagation in Optical Fibers, Fundamental Laws of Optics, Ray Propagation in Step-Index Fibers, Ray Propagation in Graded-Index Fibers

[8] COMMUNICATION SYSTEMS

Communication system components, Analog modulation- AM, FM,PM. Digital modulation-ASK, FSK, PSK

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill
2) David Griffiths, Introduction to Electrodynamics
3) S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
4) R.P Khare, Fiber Optics and Optoelectronics, Oxford University Press
5) Sanjay Sharma, Communication Systems: Analog and Digital
6) Halliday and Resnick, Physics
7) W. Saslow, Electricity, magnetism and light
8) Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
9) B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
10) Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, OxfordUniversity Press, New York (2007).
11) P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997)
12) Behrouz A. Forouzan, Data communication and networking.
13) B. P lathi, Modern Digital and Analog Communication Systems, Third edition

D. COURSE OUTCOME

At the end of the course, students will be able to

- Illustrate intrinsic and extrinsic semiconductors, their applications and carrier generation and recombination with variations in doping density, temperature and other regulations.
- Design half wave, full wave rectifier circuit and voltage regulator circuit using Zener diode, PN diode and NPN, PNP transistors.
- Implement a transistor as a switch and Analyze Transistor input output characteristics, biasing circuits, Compute load line and calculate the operating point.
- Analyze structure of the oscillator and discriminate between Sinusoidal oscillator, Phase shift oscillator and Crystal oscillator.
- Assess the performance & characteristics of Opto-electronic semiconductor devices like LED,

LASER, Photo detectors

- Devise the ray optics propagation in step index and graded index fiber and Synthesize the use of optoelectronic devices in fiber optic communications.
- Illustrate pro and cons of analog and digital modulation techniques (AM, FM, PM, ASK, FSK, PSK) based on the need of system components.
- Justify the requirement of CMOS based on the fundamental study of nMOS and pMOS and describe working of 1 bit DRAM cells.

B. TECH. SEMESTER II (EC/CE/IT)

SUBJECT: HARDWARE WORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	4	4	2	-	-	100*	-	100

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objective of the course is to familiarize students with various hardware tools and techniques. The course aims at imparting practical knowledge of various electronic components, computer hardware, and internet technology.

B. DETAILED SYLLABUS

[1] ELECTRONIC COMPONENTS

Digital Multimeter, Power Supply, Function Generator, Cathode Ray Oscilloscope, Digital Oscilloscope, Measurement of Phase Difference in single phase circuit, Various Electrical and Electronics component like LED, LDR, Photo-diode, MOSFET, MCB and Relay.

[2] COMPUTER HARDWARE

Introduction to a personal computer and its basic peripherals, installation of Operating System Software and the required device drivers. Students are suggested to perform similar tasks on theLaptop scenario wherever possible.

[3] PERIPHERALS

Programming of Computer Ports & Interfacing of Electronic Components, Cables and Connectors like RJ45, RS232 and CRO probe.

[4] INTERNET

Introduction to Internet & World Wide Web modules, Making a PC Internet ready: Introduction To Internet and TCP/IP, Ethernet Connection, WiFi connection, configure TCP/IP (IP, Gateway,DNS, and Proxy), and use of ping command, Information sharing and data transfer over Local Area Network and Internet.

[5] WEB INFRASTRUCTURE

Basic Components of Web Sites, Front end & back end tools and technology. HTML & CSS, Developing, Configuring and deploying a website.

[6] IOT BOARDS AND CIRCUIT SIMULATION

Introduction to IOT boards like Arduino, Raspberry Pie etc. Interfacing, Circuit designing and PCB designing.

[7] MINI PROJECT

Students will develop a mini project related to the topics listed above.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Electronic Components and Materials Principles, Dr. Madhuri A Joshi, 2nd Edition, ShroffPublishers & Distributors PVT. LTD.
2) A Textbook of Computer Hardware and Networking, Jyotika Deshmukh, D J Publications
3) Learning Web Design, Jennifer Robbins, 4th edition, O'Reilly Media

D. COURSE OUTCOME

After completing the course, the students will,

- Have knowledge of various electronics components and computer hardware.
- The students will be aware of Internet Technology infrastructure.

B.TECH. SEMESTER II (EC/CE/IT)

SUBJECT: ENGLISH

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	2	4	3	40	-	50*	-	90

*TW Marks includes Viva based on TW

A. COURSE OBJECTIVE

The objective of the course is to provide basic knowledge of the English language to students coming from different backgrounds. The course aims to teach English Grammar and Communications skills which will be useful to engineers.

B. DETAILED SYLLABUS

[1] VOCABULARY BUILDING

The concept of Word Formation, Root words from foreign languages and their use in English,Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives,Synonyms, antonyms, and standard abbreviations.

[2] BASIC WRITING SKILLS

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

[3] IDENTIFYING COMMON ERRORS IN WRITING

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

[4] NATURE AND STYLE OF SENSIBLE WRITING

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

[5] WRITING PRACTICES

Comprehension, Précis Writing, Essay Writing

[6] ORAL COMMUNICATION

(This unit involves interactive practice sessions in Language Lab) Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common, Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Practical English Usage. Michael Swan. OUP. 1995.
2) Remedial English Grammar. F.T. Wood. Macmillan.2007
3) On Writing Well. William Zinsser. Harper Resource Book. 2001
4) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

D. COURSE OUTCOME

After successful completion of the course, students will be able to

- Understand the vocabulary and their root forms to enhance vocabulary level
- Enhance their writing in effective way
- Rectify common errors in their speaking and writing
- Develop efficiency in writing
- Be competent at Public Speaking and Interviews
- Acquire Proficiency in all four skills of Language

B. TECH. SEMESTER – II (EC/CE/IT)

SUBJECT: ENVIRONMENTAL STUDIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	0	2	0	40	--	--	--	40

A. COURSE OBJECTIVE

The objective for this course is to bring awareness about sustainable development as a key to the future of mankind. Understanding, analyzing and proposing solutions to the contemporary environmental issues and problems of pollution, population explosion, solid waste disposal, environmental degradation, economic productivity, global warming, ozone layer depletion and loss of biodiversity.

B. DETAILED SYLLABUS

[1] THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance & Need for public awareness

[2] NATURAL RESOURCES

Renewable and non-renewable resources: Natural resources and associated problems**,** Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, and their effects on forests and tribal people ,Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefit and problems,Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies, Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies, Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification, Role of an individual in conservation of natural resources. Equitable use of resources of sustainable lifestyles

[3] ECOSYSTEMS

Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

[4] 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 mega- diversity nation, Hot-spots of biodiversity, Threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

[5] ENVIRONMENTAL POLLUTION

Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management, causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides

[6] SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people: its problems and concerns. Case studies, Environmental ethics: Issues and possible solutions, Climate change: Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies, Wasteland reclamation, Consumerism and waste products, Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention & Control of Pollution) Act, Wildlife protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness

[7] HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations, population explosion, Family Welfare Program, environment and human health, human rights, Value education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environmental and human health, Case studies

[8] FIELD WORK

Visit to a local area to document environmental assets (river/forest/grassland/hill/mountain), Visit to a local polluted site – Urban / Rural / Industrial/ Agricultural, Study of common plants, insects, birds, Study of simple ecosystems – pond, river, hill, slopes etc.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Erach Bharucha Textbook of Environmental Studies; Second Edition, Universities Press:Hyderabad, 2013.
2) Rajagopalan, R. Environmental Studies; Oxford University Press: India, 2015.
3) Varandani, N. S. Basics of Environmental studies; Lambert Academic Publishing: Germany,2013.
4) Rao, C. S. Environmental Pollution Control Engineering; Wiley publishers: New Delhi,2006
5) Clark, R. S. Marine Pollution; Clanderson Press Oxford: Bath, 2001.
6) Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., Environmental

Encyclopedia;Jaico Publ. House: Mumbai, 2001.

7) De, A. K. Environmental Chemistry; Wiley Eastern: New Delhi, 2006.

D. COURSE OUTCOME

After learning this course students should be able to :

- Recall, understand and interpret the terminologies used in environmental studies correctly
- Relate the importance of natural resources, biodiversity, hotspots and deduce the threats to biodiversity
- Analyze the factors causing environmental pollution, formulate the role of an individual in abatement and control of pollution, improve disaster management techniques
- Evaluate the social issues involved in climate change, water conservation, rainwater harvesting, wasteland reclamation, consumerism and waste generation, environmental ethics, environmental laws and requirement of public awareness
- Understand the issues related to population, family welfare programs, human health, value education, and role of IT in environment
- Make use of the field work including visits to local areas to document environmental assets, assess the polluted sites, study species and ecosystems in our surroundings

B. Tech. Semester III

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Data Structure and Algorithms	3	1	2	6	5.0	60	40	25	25	150
Database Management Systems	3	1	2	6	5.0	60	40	25	25	150
Design of Digital Circuit	3	1	2	6	5.0	60	40	25	25	150
Probability and Statistics	2	0	0	2	2.0	40	-	-	-	40
Universal Human Values	3	0	0	3	3.0	60	-	-	-	60
Essence of Indian Knowledge Tradition	2	0	0	2	0.0	-	-	-	-	-
Web Development Workshop	0	0	2	2	1.0	-	-	25	25	50
	16	3	8	27	21	280	120	100	100	600

B. Tech. Semester IV

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Discrete Mathematics	3	1	0	4	4.0	60	40	-	-	100
Design and Analysis of Algorithm	3	1	2	6	5.0	60	40	25	25	150
Computer System Architecture	4	0	2	6	5.0	60	40	25	25	150
Professional Elective-I	4	0	2	6	5.0	60	40	25	25	150
Software Engineering Principles and Practices	3	1	2	6	5.0	60	40	25	25	150
Software Project	0	0	2	2	1.0	-	-	25	25	50
	17	3	10	30	25.0	300	200	125	125	750

B. TECH. SEMESTER – III (CE)

SUBJECT: DATA STRUCTURE AND ALGORITHMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

Learn different types of data representation and handling which is one of the fundamental concepts of computer engineering. Detailed study of various data structures and their applications. Provide an in-depth knowledge of various techniques which will be useful for problem solving.

B. DETAILED SYLLABUS

[1] BASIC CONCEPTS

Algorithm specifications.

[2] ARRAYS

Array as an abstract data type, representation of Arrays

[3] STACKS & QUEUES

Stack as an abstract data type, queue as an abstract type, evaluation of expressions

[4] LINKED LIST

Singly linked lists, doubly linked list, circular list, linked stacks and queues, polynomials, generalized lists.

[5] TREES

Introduction, binary trees, binary tree traversal and tree iterators, additional binary tree operations, threaded binary trees, heaps, binary search tree, forests, Huffman algorithm.

[6] GRAPHS

The graph abstract data type, graph traversal, directed graph, weighted graph, shortest path-Dijkastra's algorithm, minimum spanning tree.

[7] SORTING

Insertion sort, quick sort, merge sort, heap sort, shell sort, count sort, sorting on several keys,list and table sort, summary of internal sorting.

[8] HASHING

Hash table, hash function, collision, collision resolution techniques.

[9] SEARCH TECHNIQUES

Sequential search, Binary search, AVL trees, 2-3 trees, 2-3-4 trees, read-black trees, B- trees, Digital search trees, Tries.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Data Structures and Algorithms in Java (4th edition) by Michael T. Goodrich and Roberto Tamassia Publisher: John Wiley & Sons, Inc
2) Data Structures and Program Design in C, Second Edition, by Robert L. Kruse, Bruce P. Leung,Pearson Education.
3) Data Structures And Algorithms Made Easy In JAVA by Narasimha Karumanchi, Publisher:Careermonk Publications (Sep 2011).
4) An Introduction to Data Structures with Applications, Second Edition, by Tremblay and Soren-son, McGraw Hill.

D. COURSE OUTCOME

- Obtaining in-depth knowledge of various data structures used by computers.
- To learn selection of appropriate data structure for a specific requirement.
- To be able to write efficient programs to solve various real life problems.
- To create a foundation and motivation for learning and exploring various methods of data handling.

B. TECH. SEMESTER – III (CE)

SUBJECT: DATABASE MANAGEMENT SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

- Objective of this course is to provide details of database architecture
- To create database with constraints in normalized form and query it efficiently
- To learn different structures-file organization of database with proper indexing
- To gain knowledge how a transaction works, transaction ACID properties, concurrency control, deadlock, recovery of database on failure.
- To prepare logical database design of any System

B. DETAILED SYLLABUS

[1] BASIC CONCEPTS

Purpose of database system, View of data, Database abstraction and Models, Database Languages, Transaction management, Storage management, Database administrator, Database users, Overall system structure.

[2] ENTITY RELATION MODEL

Entity sets, Relationship sets, Attributes, Constraints, Keys, Entity relationship diagrams, Weak entity sets, Generalization, Specialization, Aggregation, Design of an E-R database schema, Reduction of an E-R schema to tables.

[3] RELATIONAL DATABASE MANAGEMENT SYSTEM

Relational Model, Structure of database, Relational algebra, Extended relational algebra operation, tuple relational calculus, Domain relational calculus, Modification of database, Views, Structured Query Language, Background, Basic structure, Integrity Constraints, Domain constraints, Referential integrity, Assertions, Triggers, Functional Dependencies, Database Pitfalls in relational database design, Decomposition, Normalization, I,II,III normal Forms, Normalization using functional dependencies, Normalization using multi valued dependencies, Domain key normal form, Alternative approach to database design

[4] FILE SYSTEM STRUCTURE

Indexing & Hashing, File organization, Organization of records in files, Data dictionary storage, Basic concepts of indexing, Order indices, B- Tree index files, B+ -Tree index files, Static hashing & Dynamic Hashing.

[5] QUERY PROCESSING

Overview, Catalog information for cost estimation, Measures of query cost, Selection operation, Sorting, Join operation, Other operations, Choice of evaluation plans

[6] TRANSACTION PROCESSING

Transaction concepts, Transaction state, Implementation of atomicity & durability, Concurrent executions, Serializability, Conflict serializability, View serializability, Testing of conflict and view serializability.

[7] CONCURRENCY CONTROL

Lock based protocols, Time-stamp based protocol, Validation based protocol, Multiple granularity, Multi-version schemes, Deadlock handling, Insert & delete operations, Concurrency in index structures.

[8] RECOVERY SYSTEM

Failure classification, Storage structure, Recovery & Atomicity, Log-based recovery,Shadow paging, Recovery with concurrent transactions, Buffer management, Failure with loss of non-volatile storage, Advance recovery techniques.

[9] DISTRIBUTED DATABASE

Security and Integrity of database

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "DataBase System Concepts", Henry F. Korth and A. Slberschatz 2nd Edition, McGraw-Hill 1991.
2) An Introduction to Database Systems", C.J.Date, Pearson Publication

D. COURSE OUTCOME

- To understand database architecture and different types of database users.
- To Create Entity-Relationship Diagram for the given system and to create a normalized relational database from it with proper constraints.
- To install databases on their machines and will be able to query,manipulate and manage it efficiently.
- To Understand concepts of Transactions, requirement of ACID properties, issues related to concurrency, deadlock transaction failure and recovery with their related protocols/solutions

B. TECH. SEMESTER – III (CE)

SUBJECT: DESIGN OF DIGITAL CIRCUITS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

To acquire the basic knowledge of various digital logic components to understand digital electronics circuits. To prepare students to perform the analysis and design of various digital electronic circuits.

B. DETAILED SYLLABUS

[1] BINARY SYSTEMS

Introduction to Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, complements, binary Codes, Binary Storage and Registers, Binary Logic, Integrated Circuits.

[2] BOOLEAN ALGEBRA AND LOGIC GATES

Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, IC Digital Logic Families.

[3] SIMPLIFICATION OF BOOLEAN FUNCTIONS

The Map Method, Two and Three Variable Maps, Four-Variable Map, Five and Six Variable Maps, Product of Sums Simplification, NAND and NOR Implementations, Don't- Care Conditions, The Tabulation Method, Determination of Prime-Implicants, Selection of Prime-implicants, Concluding Remarks.

[4] COMBINATIONAL LOGIC

Introduction, Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive OR and Equivalence Functions.

[5] COMBINATIONAL LOGIC WITH MSI AND LSI

Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, Read-Only Memory (ROM), Programmable Logic Array (PLA), Concluding Remarks.

[6] SEQUENTIAL LOGIC

Introduction, Flip-Flops, Triggering of Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Design of

Counters, Design with State Equations.

[7] REGISTER, COUNTERS AND THE MEMORY UNIT

Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences, The Memory Unit, Examples of Random Access Memories.

[8] DIGITAL INTEGRATED CIRCUITS

Introduction, Bipolar Transistor Characteristics, RTL and DTL Circuits, Integrated- Injection Logic, Transistor-Transistor Logic, Emitter-Coupled logic, Metal-Oxide Semiconductor, Complementary MOS.

[9] VERILOG

Introduction, Overview of Digital Design with Verilog HDL, Gate-level Modeling (full ad-dre, multiplexer, full subtractor, comparator, decoder, demultiplexer, Flip-flops)

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Digital Logic and Computer Design, M.Morris Mano
2) VERILOG HDL, Samir Palmitkar, Pearson Education

D. COURSE OUTCOME

At the end of the course, students will be able to

- Understand, convert and examine the structure of various number systems and its application in digital design.
- Design and optimize Boolean functions and combination circuits.
- Understand, analyze and design sequential circuits.
- Apply the concept of finite state machines for digital system design

B.TECH. SEMESTER – III (CE)

SUBJECT: PROBABILITY AND STATISTICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	0	2	2	40	-	-	-	40

A. COURSE OBJECTIVE

The objective of the course is to provide computer engineering students the knowledge of probability which will be useful in the core subjects of computer science offered in the higher semester.

B. DETAILED SYLLABUS

[1] BASIC PROBABILITY

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

[2] CONTINUOUS PROBABILITY DISTRIBUTION

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

[3] BIVARIATE DISTRIBUTION

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

[4] BASIC STATISTICS

Measures of Central tendency: Moments, skewness and Kurtosis – Probability distributions: Binomial, Poisson and Normal – evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000.
2) E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.
3) P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal BookStall, 2003.
4) S. Ross, "A First Course in Probability", Pearson Education India, 2002.
5) W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.
6) N.P. Bali and M. Goyal, "A textbook of Engineering Mathematics", Laxmi Publications,2010.

7) T. Veerarajan, “Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 2010.

D. COURSE OUTCOME

At the end of the course, students will be able to,

- Understand and apply concepts of probability
- Will be able to understand subjects which involve deeper knowledge of probability and statistics.

B. TECH. SEMESTER – III (CE)

SUBJECT: UNIVERSAL HUMAN VALUES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	0	0	3	3	60	-	-	-	60

A. COURSE OBJECTIVE

This introductory course input is intended:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings
- facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value- based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

B. DETAILED SYLLABUS

[1] COURSE INTRODUCTION

Need, Basic Guidelines, Content and Process for Value Education Self Exploration– what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels

[2] UNDERSTANDING HARMONY IN THE HUMAN BEING

Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya

[3] UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY

Harmony in Human-Human Relationship Understanding Harmony in the family – the basic

unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhauma Vyavastha)- from family to world family!

[4] UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE

Whole existence as Coexistence : Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

[5] IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order

C. RECOMMENDED TEXTBOOK/ REFERENCE BOOKS

1) R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professionalEthics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2) JeevanVidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3) Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4) The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5) Small is Beautiful - E. F Schumacher.
6) Slow is Beautiful - Cecile Andrews
7) Economy of Permanence - J C Kumarappa
8) Bharat Mein Angreji Raj - Pandit Sunderlal

D. COURSE OUTCOME

- The students start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.
- The students are able to note that the natural acceptance (intention) is always for living in harmony, only competence is lacking!
- The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.
- The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfillment. E.g. mutually enriching production system with rest of nature.

B.TECH. SEMESTER – III (CE)

SUBJECT: ESSENCE OF INDIAN KNOWLEDGE TRADITION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
2	0	0	2	0	-	-	-	-	-

A. COURSE OBJECTIVE

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic lifestyle of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system. The course also focuses on Indian philosophical traditions, Indian linguistic Tradition, and Indian artistic tradition.

B. DETAILED SYLLABUS

[1] BASIC STRUCTURE OF INDIAN KNOWLEDGE SYSTEM

Ashtadashvidya, 4 - Ved, 4 - Upved, (Ayurved, dhanurveda, gandharva veda, sthapatya, etc), 6 – Vedang (shiksha, kalp, nirukti, vyakaran, jyotish, chhand) 4 upang (dharmashastra, mimansa, purana, tarkshastra)

[2] MODERN SCIENCE AND INDIAN KNOWLEDGE SYSTEM

Relating modern science with Traditional Indian knowledge, Relevance of Indian Knowledge System

[3] YOGA AND HOLISTIC HEALTH

Different types of Yoga, Role of Yoga in building holistic health

[4] CASE STUDIES

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bha-van, Mumbai. 5 th Edition, 2014
2) Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3) Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan
4) Fritz of Capra, Tao of Physics
5) Fritz of Capra, The Wave of life

6) VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmaya Foundation,Velliarnad, Arnakulam
7) GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, VidyanidhiPrakashan, Delhi 2016
8) RN Jha, Science of Consciousness Psychotherapy And Yoga Practices, Vidyanidhi Prakashan,Delhi 2016
9) P B Sharma (English translation), Shodashang Hridayan

D. COURSE OUTCOME

At the end of the course, students should be able to,

- Understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.
- Learn a holistic lifestyle of yogic science and wisdom.
- Understand Indian philosophical, linguistic and artistic traditions.

B. TECH. SEMESTER – III (CE)

SUBJECT: WEB DEVELOPMENT WORKSHOP

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	2	2	1	-	-	25	25	50

A. COURSE OBJECTIVE

To learn basics to advanced concepts of Javascripts. To learn jQuery fundamentals To learn HTML, CSS, and JavaScript framework Bootstrap 5.

B. DETAILED SYLLABUS

[1] JAVASCRIPT

Variable Naming Rules and JavaScript Data Types, let vs var, 'use strict', operators and expressions, Javascript – flow control (branching and looping)

[2] JAVASCRIPT FUNCTIONS & ARRAYS

Javascript functions, function expression, and arrow functions. Javascript template literals, and tagged template literals, Javascript arrays, object literals and constructor functions, avascript: spread operator, destructuring arrays and objects, closure

[3] DOM & BASIC JQUERY

[4] BOOTSTRAP

Introduction to Bootstrap, Bootstrap Grid, Bootstrap Components, Bootstrap Plug-Ins

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Web Design with HTML, CSS, JavaScript and jQuery Set, by John Ducket, Wiley
2) Javascript: The Good Parts, first edition, by Douglas Crockford, O′Reilly
3) Bootstrap 4 quick start, by Jacob D. Lett, Bootstrap Creative

D. COURSE OUTCOME

Students will be able to

- Develop familiarity with the JavaScript language.
- Learn to use best-practice idioms and patterns.
- Understand concepts commonly used in dynamic language programming, such as introspection, higher-order functions, and closures.
- Become adept at implementing client-side interfaces through the use of the DOM and

jQuery

- Become familiar with common libraries and tools that are used in web application development at client side.

B. TECH. SEMESTER – IV (CE)

SUBJECT: DISCRETE MATHEMATICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	0	4	4	60	40	-	-	100

A. COURSE OBJECTIVE

The objective of this course is to teach students how to think logically and mathematically. The course stresses on mathematical reasoning and describes different ways in which mathematical problems could be solved. There are four thematic areas covered in this course: mathematical reasoning, combinatorial analysis, discrete structures, and mathematical modeling. Topics in this course include recurrence relation and generating functions,logic, set theory, counting, graph theory, trees, boolean algebra, and modeling computation.

B. DETAILED SYLLABUS

[1] SETS AND PROPOSITIONS

Combination, finite, uncountably infinite and infinite sets, mathematical induction, principles of inclusion and exclusion, propositions.

[2] PERMUTATION, COMBINATION, DISCRETE PROBABILITIES

Rules of sums and products, permutations, combinations, generation, discrete probability, conditional probability, information.

[3] RELATION AND FUNCTIONS

Relational model of databases, properties of binary relations, equivalence relation, partitions, partial ordering, lattices, chains and antichains, functions and pigeon-hole principle.

[4] GRAPHS

Basic terminology, multi- and weighted graphs, paths, circuits, shortest path, Eulerian path, Traveling Salesman problem, factors of a graph, planar graphs.

[5] TREES

Trees, rooted trees, path length, prefix codes, binary search trees, spanning trees and cut- sets, minimum spanning trees, transport networks.

[6] FINITE STATE MACHINE

FSM as models of physical systems, equivalent machines, FSM as language recognizer.

[7] COMPUTABILITY AND FORMAL LANGUAGES

Russel's paradox and non-computability, ordered sets, languages, phrase structure grammars, types of grammars and languages.

[8] DISCRETE NUMERICAL FUNCTIONS

Manipulations of numerical functions, asymptotic behavior, generating functions, combinatorial problems.

[9] GROUP

Groups and sub-groups, generators, evaluation of powers, cosets, Lagrange's theorem, permutation group and Burnside's theorem, group codes, isomorphism, automorphism, homomorphism, normal subgroups, rings, integral domains and fields, ring homomorphism, polynomial rings and cyclic codes.

[10] LATTICES AND BOOLEAN ALGEBRA

Lattices and algebraic systems, principle of duality, properties of algebraic systems, distributive lattices, boolean algebras, uniqueness, boolean functions and expressions, propositional calculus.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "Elements of Discrete Mathematics", C.L. Liu, 2nd Ed., McGraw-Hill
2) "Modern Applied Algebra", Birkhoff and Bartee, McGraw-Hill, CBS.
3) "Discrete mathematics - a unified approach", Stephen a. Wiitala, computer science series, Mcgraw-Hill.

D. COURSE OUTCOME

Students will be able to:

- Solve counting problems based on set principles and operations.
- Apply counting principles to determine likelihood of the event under consideration.
- Demonstrate an understanding of relations and functions and be able to determine their properties.
- Model problems in Computer Science using graphs and trees.
- Model problems of counting using recurrence relations and generating functions
- Use finite-state machines to model computer operations

B. TECH. SEMESTER IV (CE)

SUBJECT: DESIGN AND ANALYSIS OF ALGORITHM

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The subject is oriented towards the importance of algorithms for solving any industry problem. It highlights how different algorithms for the same task affect the overall execution time. Various strategies to develop and analyze the algorithm were broadly covered in the subject. Use of suitable data structures in algorithms is also discussed. It also separates decision problems and optimization problems. It also covers recursive and non-recursive algorithms to solve the problem.

B. DETAILED SYLLABUS

[1] **Introduction to algorithms:** Algorithm definition, characteristics, Specification, Performance Analysis: Time Complexity, Space Complexity, Asymptotic Notations and related Examples, Introduction to the Worst Case, Best Case and Average Case Analysis of problem, Introduction to different algorithm design techniques

[2] **Elementary Data structures:** Revision of elementary Data structures and study of Disjoint set data structure with its operations and time complexity.

[3] **Methods for solving recurrence relation for finding time complexity:** Substitution Method, Recurrence Tree Method, Master's Theorem Method, Homogeneous and Non-Homogeneous Recurrence and its solution, Change of Variable Method

[4] **Overview of searching & sorting techniques:** Insertion sort and analysis, Quick sort and Merge Sort as part of Divide, Conquer and Combine strategy, Linear Search, Binary Search with their recurrence and solutions.

[5] **The Greedy Methodology:** Introduction to Greedy strategy and its Elements. General Problems under Greedy: Fractional Knapsack problem, Activity Selection problem, Making change problem, Prim's and Kruskal's algorithms to find the Minimum Cost Spanning Tree, Dijkstra's algorithm to find the Single Source Shortest Path

[6] **Dynamic Programming:** Introduction to Dynamic Programming: Overlapping subproblems and Optimal Substructure property, Concept of Tabular Method and Memoization.
General problems under Dynamic Programming: 0/1 Knapsack algorithm, Making Change algorithm, Maximum Sum Contiguous Subarray, Matrix Chain Multiplication algorithm, Longest Common Subsequence, String Editing, and Multistage Graph problem with Example and Analysis.

[7] **Graph Traversal & Searching:** Breadth First Search, Depth First Search and their Analysis

using Adjacency Matrix and Adjacency List, Topological Sorting as an Application of DFS, Finding of Articulation Points using Tarjan's Algorithm, Finding Strongly Connected Components, All Pair Shortest Paths and Bellman Ford Algorithm to find single source shortest path algorithms with analysis

[8] **Backtracking Techniques:** General Method of Backtracking, State Space Tree Exploration: Live Node, E- Node, Dead Node, Explicit and Implicit constraints for various problems, importance of Bounding function using some example problems.
Problems and Analysis for Consideration:: Algorithms for the N-Queens problem, Graph Coloring problem, Hamiltonian Cycle problem, Sum of Subset Problem using Backtracking

[9] **Branch & Bound Techniques:** General Method of Branch and Bound, Difference between Backtracking and Branch and Bound. Least Cost Branch and Bound strategy to solve various problems like Job Assignment Problem, 8 or 15-Puzzle problem, Traveling Salesperson problem,0/1 Knapsack.

[10] **Lower bound theory:** Introduction to Lower Bound Theory , Comparison Tree approach to derive Lower Bounds. Lower bound calculations for Sorting, Searching, Largest and 2nd Largest numbers from an array, Fake coin problem

[11] **NP-Hard & NP-Complete problems:** Basic Concepts, Concept of Non-Deterministic Algorithms and its elaboration through examples, Decision and Optimization versions of problem using examples, Theory of polynomial time reductions and related Examples, Computational Complexity Classes: P, NP, NP-Complete, NP-Hard and their relationships with necessary examples.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub.
2) Fundamentals of Algorithms by Brassard & Bratley, PHI.
3) Introduction to Algorithms by Coreman, Tata McGraw Hill.
4) The art of Computer Programming Vol.I & III, Kunth, Addison Wesley.

D. COURSE OUTCOME

- Develop efficient and effective computer algorithms.
- Analyze algorithms and estimate their worst-case and average-case behavior.
- This will help for development of efficient and optimized software and problem solving approaches.
- Apply their theoretical knowledge in practice (via the practical component of the course)

B. TECH. SEMESTER – IV (CE)

SUBJECT: COMPUTER SYSTEM ARCHITECTURE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The objective of this course is to learn the structure and Functions of various components of the CPU. It is focused on various ways to represent the data and instructions, basic design of the ALU,Control Unit, Designing of the registers. To learn the basic concepts of pipelining and Interfacing of IO devices and memory with the CPU.

B. DETAILED SYLLABUS

[1] BASIC FUNCTIONAL BLOCKS OF A COMPUTER

CPU, memory, input-output subsystems, control unit, datapath design, interconnection structure, register transfer language, register transfer, bus and memory transfers, arithmetic logic shift unit

[2] DATA REPRESENTATION

Signed number representation, fixed and floating point representations, character representation, IEEE 754 standard of representation

[3] BASIC COMPUTER ORGANIZATION AND DESIGN

Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, I/O instructions, design of accumulator logic.

[4] DATAPATH DESIGN

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 - non-restoring and restoring techniques, floating point arithmetic

[5] CONTROL UNIT DESIGN

Hardwired control, micro programmed control, nano programmed control

[6] PROGRAMMING THE BASIC COMPUTER

Introduction, machine language, assembly language, the assembler, program loops, programming arithmetic and logic operations, subroutines, I/O programming.

[7] CENTRAL PROCESSING UNIT

Register organization, stack organization, instruction format, addressing mode, data transfer and manipulation, program control, RISC processors.

[8] PIPELINING

Basic concepts of pipelining, throughput and speedup, pipeline hazards.

[9] INPUT OUTPUT ORGANIZATION

Peripheral devices, I/O interface, asynchronous data transfer, modes of transfer, priority interrupt, DMA, I/O processors, serial communication

[10] MEMORY ORGANIZATION

Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policy.

[11] CASE STUDY : 8085 MICROPROCESSOR

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Computer System Architecture by Morris Mano, 3rd Ed., PHI
2) Computer Architecture and Organization by John P. Hayes, Computer science series, McGRAW-HILL
3) Microprocessor Architecture, Programming and Applications With The 8085 by R.S. Gaonkar 5thEd., CBS Publisher
4) Computer Organization and Design: The Hardware/Software Interface by David A. Patterson andJohn L. Hennessy, Elsevier.
5) Computer Organization by Carl Hamachar, Zvonco Vranesic and Safwat Zaky, McGraw Hill.
6) Computer Organization and Architecture: Designing for Performance by William Stallings, Pear-son Education.

D. COURSE OUTCOME

- The students will be able to: Design the ALU using the register level components.
- Students will be able to design the control unit for the basic instruction set.
- Students will be able to understand how the interrupts and DMA is used when dealing with the peripheral devices.
- Students will be able to understand the interfacing between various levels of memories with the CPU.

B. TECH. SEMESTER – IV (CE)

SUBJECT: JAVA TECHNOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The objective of this course is to equip the learners with the core and advanced features of contemporary Java which would enable them to work with complex programs related to managing data and processes over the network and also to make the students familiar with the concepts of hibernate and Spring Frameworks.

B. DETAILED SYLLABUS

[1] INTRODUCTION TO JAVA PROGRAMMING

Java environment and program development, Java source file structure, its compilation and execution. Language fundamentals: Lexical tokens, identifiers, keywords, literals, comments, primitive data-types, operators, arrays, String, StringBuffer and StringBuilder class, Object Class

[2] OBJECT ORIENTED CONCEPTS IN JAVA

Introduction to class object and object reference, object lifetime and garbage collection, constructor and initialization block, use of “this”, “static” and “final” keywords, nested class, inner class, anonymous classes Types of inheritance, role of constructors in inheritance, use of “super”, inheritance of interfaces, polymorphism with inheritance, Types exceptions and errors, control flow in exceptions, JVM reaction to exceptions, use of try, catch, finally, throw, throws, in-built and user defined exceptions, checked and unchecked exceptions

[3] PACKAGE

Organizing classes and interfaces in packages, package as access protection, defining package, CLASSPATH setting for packages, making jar files for library packages, import and static import

[4] MULTITHREADED PROGRAMMING

Understanding threads, needs of multi-threaded programming, thread life-cycle, thread priorities, synchronizing threads, inter communication of threads

[5] INPUT/OUTPUT OPERATION IN JAVA

Streams and the new i/o capabilities, understanding streams, the classes for input and output, the standard streams, working with file object, file i/o basics, buffer and buffer management, read/write operations with file, serializing objects.

[6] COLLECTION FRAMEWORK AND GENERICS

Collections of objects, collections: sets, sequence, map, generics, lambda expressions, method references, default method, Stream API

[7] ENTERPRISE ARCHITECTURE IN JAVA

N-tier Architecture, introduction to web container, web server and structure of web Application Servlet lifecycle and configuration, servlet request and responses,session management Introduction to JSP, its lifecycle, scripting elements, implicit objects, JSPdirectives, JSP standard actions and JSTL Introduction to JDBC API, types of JDBC drivers, steps to createJDBC application

[8] HIBERNATE FRAMEWORK

Introduction to O-R Mapping Hibernate Basics, Hibernate Architecture, Hibernate Configurations, POJO (Plain Old Java Objects) classes and O/R Mapping Object Identifier, Hibernate mapping (One-to-One Association, One-to-Many Association Many-to-One Association, Many-to-Many Association, Collection Mapping, Component mapping), Inheritance Mapping, Hibernate Query Language, Criteria Queries, Hibernate in Web Application

[9] SPRING FRAMEWORK

Introduction, The IoC Container and Beans, The Application Context, Dependency Injection, Data Validation and Type Conversion, Package Dependencies and Build Tool (Maven /Gradle), Spring Boot with Initializer, Spring Web MVC, Spring and Persistence

C. RECOMMENDED TEXT / REFERENCE BOOKS

RECOMMENDED TEXT BOOKS:

1) Core Java Volume I –Fundamentals, 8th Edition by Cay Horstmann and Gray Cornell, Pearson Education
2) Java 8 in Action: Lambdas, Streams, and Functional-style Programming by Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft, Manning publications
3) Professional Java Server Programming by Subrahmanyam & Cedric, SPD Publications
4) Spring in Action , 5th edition , by Craig Walls, MANNING Publications
5) Hibernate in Action by Christian Bauer and Gavin King, MANNING Publications

REFERENCE BOOKS

1) Thinking in Java by Bruce Eckel, 4thEd. Pearson Education.
2) Learning Java by By Patrick Niemeyer and Jonathan Knudsen, 4thEd, O'reilly Media.
3) Head First Servlets and JSP, 2nd edition, by Bert Bates, Kathy Sierra & Bryan Basham, O'Reilly Media.
4) J2EE Complete Reference, James Keogh, TMH.

D. COURSE OUTCOMES

At the end of the course, the students should be able to:

- Acquire quality knowledge of the features of core Java.
- Apply the advanced concepts of Java programming with database connectivity.

- Design and develop platform independent applications using a variety of component based frameworks.
- Implement the concepts of Hibernate and Spring for the rapid development of enterprise applications.

B. TECH. SEMESTER – IV (CE)

SUBJECT: VISUAL TECHNOLOGY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The objective of this course is to introduce the event-driven programming language Visual C++. The course aims on developing applications using document/view architecture, dialogue based applications and reusable component development. Emphasis of the course is on hands-on programming experience with Visual C++ in building real world data driven applications.

B. DETAILED SYLLABUS

[1] INTRODUCTION

Introduction to Windows programming, introduction to VC++ IDE

[2] WINDOWS GUI PROGRAMMING

Messages (Message passing and handling), GDI Objects (Pen, Brush, etc.), Mouse Handling, Keyboard Handling, Mapping Modes, Menu, Toolbar and Status bar, Scrolling and Split-ting views

[3] DOCUMENT/VIEW ARCHITECTURE

Serialization (storing and retrieving to and from disk)

[4] MULTI-THREADED PROGRAMMING

[5] DIALOG BASED APPLICATION

Model and Model-less dialogues, Windows dialog controls, Buttons, Edit box, Check box, Radio Button, combo box, list box, Animation control, spin control, slider control, Tree view control, List view control.

[6] ACTIVE X CONTROL

Using Active X control, Creating Active X control

[7] DATABASE CONNECTIVITY USING DAO

[8] DLL DEVELOPMENT

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Mastering Visual C++ 6.0, By: Michael J. Young.
2) Programming with microsoft visual c++ 6.0, by Devid j. Kruglicnski, George Shepherd., Scot Wings.

D. COURSE OUTCOME

- Create windows GUI based applications.
- Create Document / View Architecture and Multithreaded applications in VC++.
- Create Dialog based applications using various controls.
- Create data driven applications and DLL development.

B. TECH. SEMESTER – IV (CE)

SUBJECT: SOFTWARE ENGINEERING PRINCIPLE AND PRACTICES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess	TW	Prac	Total
3	1	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The objective of the course is to understand software engineering, types of software requirements, various traditional process models, agile process models, software testing etc. Students will also learn various UML diagrams and will learn various design guidelines. Students will learn how to prepare a good software requirement specification document. They will learn various types of software testing techniques. Concepts of SCM, version management, DevOps and various software development platforms will also be taught.

B. DETAILED SYLLABUS

[1] INTRODUCTION TO SOFTWARE ENGINEERING

[2] PROCESS MODELS

Traditional Models, Unified Process models and Agile Models

[3] PROCEDURAL MODELING

Requirement engineering: Requirement engineering Process, Eliciting requirements, SRS, Design concepts and principles, Architectural design, User interface design, Component level design, Deployment-level Design Elements

[4] OBJECT ORIENTED MODELING

Classes, Object, UML Diagrams: Use case, Sequence, Class, State, Activity, Sequence, Component, and Deployment.

[5] TESTING STRATEGY AND TACTICS

Software Testing strategies, White box testing, Basis path testing, Control structure testing, Black box testing, Object oriented testing.

[6] AGILE SOFTWARE DEVELOPMENT

Scrum, Xtreme Programming, Continuous Integration and Continuous Delivery, Test driven development.

[7] VERSION CONTROL AND SOFTWARE DEVELOPMENT PLATFORM

Version Control and change management, git, introduction to online tools and platforms, GitHub, Jira, DevOps, Azure, and Jenkin

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Software Engineering, Pressman, McGraw-Hill, 1992
2) Object oriented modeling and design with UML, M. Blaha and J. Rumbaugh
3) Agile Software Development with SCRUM, Ken Schwaber and Mike Beedle
4) Grady Booch, Object Oriented Analysis & Design, Benjamin/Cummings, 1994

D. COURSE OUTCOME

- Understand software engineering concepts
- Understand various types of software requirements and prepare software requirement specification document
- Learn how to draw various diagrams and prepare design document
- Understand various agile principles and learn various agile process models
- Know software testing and various types of testing
- Learn the concepts of DevOps, SCM and various software development platforms.

B. TECH. SEMESTER – IV (CE)

SUBJECT: SOFTWARE PROJECT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
0	0	2	2	1	-	-	25	25	50

A. COURSE OBJECTIVE

- Understand tools and technology required to develop software applications.
- Build a full stack web application.

B. DETAILED SYLLABUS

[1] PROJECT BASED LEARNING

- Students at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students will work together in a team (at most three)
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work on a weekly basis to the respective internal guide.
- Project will be evaluated at least once per week in laboratory Hours during the semester and final submission will be taken at the end of the semester as a part of continuous evaluation.

C. RECOMMENDED TEXT / REFERENCE BOOKS

NA

D. COURSE OUTCOME

- Use REST framework for web application development
- Learn programming language (Python) for web application development.
- Learn to develop front end back end codes and interface it with the application.
- Testing of the web application.

B. Tech. Semester V

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Microprocessor Fundamental and Programming	3	1	2	6	5.0	60	40	25	25	150
Open Elective – I (Web Application Development)	2	0	2	4	3.0	40	-	25	25	90
Operating Systems	4	0	2	6	5.0	60	40	25	25	150
Advanced Algorithms	4	0	2	6	5.0	60	40	25	25	150
Advanced Technologies	3	1	2	6	5.0	60	40	25	25	150
Smart Device Programming	0	1	2	3	2.0	-	-	25	25	50
	16	3	12	31	25.0	280	160	150	150	740

B. Tech. Semester VI

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Professional Elective - II	4	0	2	6	5.0	60	40	25	25	150
Theory of Automata and Formal Languages	3	1	0	4	4.0	60	40	-	-	100
Open Elective – II (Web Service Development)	2	0	2	4	3.0	40	-	25	25	90
Machine Learning	3	1	2	6	5.0	60	40	25	25	150
Computer Networks	4	0	2	6	5.0	60	40	25	25	150
System Design Practice	0	1	2	3	2.0	-	-	25	25	50
	16	3	10	29	24.0	280	160	125	125	690

B. TECH. SEMESTER – V (CE)

SUBJECT: MICROPROCESSOR FUNDAMENTALS & PROGRAMMING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5.0	60	40	25	25	150

A. COURSE OBJECTIVE

To introduce students with the architecture and operation of typical microprocessors and microcontrollers. To familiarize the students with the programming and interfacing of microprocessors. To provide the foundation for designing real world applications using microprocessors and microcontrollers.

B. DETAILED SYLLABUS

[1] Introduction

Basic micro-processor architecture, ALU, registers, system bus, Peripherals. Introduction to assembly language.

[2] 8086 ASSEMBLY LANGUAGE PROGRAMMING TECHNIQUES

Objectives, Program Development Steps, Constructing the Machine Codes for 8086 Instructions, Writing Programs for Use with an Assembler, Assembly Language Program Development Tools, Flags, Jumps and WHILE-DO Implementation, REPEAT-UNTIL Implementation and Examples, Debugging Assembly Language Programs

[3] IF-THEN-ELSE STRUCTURES, PROCEDURES & MACROS

Objectives, IF-THEN, IF-THEN-ELSE, & Multiple IF-THEN-ELSE Programs, Writing and Using Procedures, Writing and Using Assembler Macros.

[4] 8086 INSTRUCTION DESCRIPTION & ASSEMBLER DIRECTIVES

Instruction Description, Assembler Directives.

[5] 8086 SYSTEM CONNECTIONS, TIMING AND TROUBLESHOOTING

Objectives, 8086 Hardware Review, Addressing Memory and Ports in Microcomputer Systems, 8086 Timing Parameters, Troubleshooting a Simple 8086-based Microcomputer

[6] INTERFACING

Interfacing RAM, ROM and I/O with the microprocessor

[7] INTERRUPTS AND INTERRUPT SERVICE PROCEDURES

Objectives, 8086 Interrupts and Interrupt Response, Hardware Interrupt Applications

[8] GENERAL-PURPOSE PROGRAMMABLE PERIPHERAL DEVICES

Basic Programming Concepts & Programmable Devices

- 8259 - Programmable Interrupt Controller
- 8251 - Programmable Interface device - Serial I/O
- 8255 - Programmable Peripheral Interface

- 8254 - Programmable Interval Timer
- 8279 – Programmable Keyboard/Display Interface
- 8237 - DMA Controller

[9] INTRODUCTION TO MICROCONTROLLER

8051 architecture, pin diagram, instruction set, memory interfacing

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Microprocessors And Interfacing (Programming & Hardware), Douglas V. Hall, McGraw Hill
2) 8086 Programming and Advance Processor Architecture, M. T. Savaliya, WIND Series, 2012
3) INTEL MICROPROCESSORS 8086/8088, 80186/80188, 80286, 80386, 80486, PENTIUM AND PENTIUM PRO PROCESSOR BY BARRY B. BREY
4) Architecture, Programming & applications with 8085/8-8080A, R. S. Gaonkar
5) 8051 Microcontroller. by K.J.Ayela, Penron publication

D. COURSE OUTCOME

After completion of the course, students are expected to be able to

- Visualize and understand different instruction formats and addressing modes
- Comprehend the key components of various architectures
- Demonstrate assembly language programming proficiency
- Develop interface logic for interconnection of peripheral devices with microprocessor and microcontroller
- Design solutions of real world applications in the relevant field

B. TECH. SEMESTER – V (CE)

SUBJECT: WEB APPLICATION DEVELOPMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	2	4	3.0	40	-	25	25	90

A. COURSE OBJECTIVE

The objective of this course is to make the students familiar with Web Application Development.The subject provides knowledge of .NET framework and .NET core architecture along with the knowledge of core C# language. The emphasis is given on building real world data driven applications. The ORM entity framework should be used while building web applications. The students will understand the complete application life cycle of a web application starting from designing to deployment on a local server.

B. DETAILED SYLLABUS

[1] .NET Framework

Architecture, Assembly development, Page life cycle of ASP.NET web application, Introduction to Visual Studio Editor, Web application development using server controls, State management for ASP.NET web application, Data driven ASP.NET web application using ORM (EF)

[2] Programming in C#

Environment, Literals, Variables and Data Types, Operators and Expressions, Handling arrays, Manipulating strings, Classes and objects, Inheritance, Interfaces, Delegates, Lambda Expression, LINQ, Events, Exception handling, Asynchronous programming

[3] .NET Core

Middleware And Request Pipeline in ASP.NET Core, .NET Core MVC, MVC Pattern, Routing, Razor, Model Validation, Test Driven Development, Tag helpers, Debugging, Tracing and Logging.

[4] Deployment

Deployment of .NET application to IIS, Deployment of .NET application to Cloud server

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Beginning ASP.NET 4.5 in C#. Author : Matthew Macdonald, Publisher : Apress
2) Pro. ASP.NET Core MVC Sixth Edition, Author : Adam Freeman, Publisher : Apress
3) Professional C# 7.0 and .NET Core 2.0, Author : Christian Nagel, Publisher : Wrox
4) ASP.NET Core in Action, Author : Andrew Lock, Publisher : MANNING

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Develop assembly(dll/exe) applications
- Design and develop database driven web applications using .NET Framework
- Construct amplifiers with active loads along with the Study of frequency response of all amplifiers
- Design and develop dynamic, cross-platform web applications using .NET Core and MVC design patterns.
- Utilize EF Core ORM for powering .NET Core driven web applications.
- Host web application into IIS and cloud environment.

B. TECH. SEMESTER – V (CE)

SUBJECT: OPERATING SYSTEM

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5.0	60	40	25	25	150

A. COURSE OBJECTIVE

To introduce students with the basic concepts of operating systems. To make students aware about details of Process management and synchronization issues. To provide detailed understanding of process based deadlocks and various aspects of memory management. To familiarize students about file and disk management aspects

B. DETAILED SYLLABUS

[1] Introduction

What is an OS?, Simple Batch Systems, Multi programmed Batched Systems, Time Sharing Systems, Personal-Computer Systems, Parallel Systems, Distributed Systems, Real-Time System

[2] Computer-System Structure

Computer-System Operation, I/O Structure, Storage Structure, Storage Hierarchy, H/W protection, General System Architecture

[3] Operating Systems Structures

System components, OS services, System calls, System programs, system structure, Virtual machines, System Design & implementation, System Generation

[4] Processes

Process concept, Process Scheduling, Operation on Processes, Cooperating processes, Interprocess Communication

[5] CPU Scheduling

Basic concepts, Scheduling criteria, Scheduling algorithms

[6] Process Synchronization

Background, The critical-section Problem, Synchronization H/W, Semaphores, classical problems of synchronization, Critical Regions, Monitors

[7] Deadlocks

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlocks, Combined Approach to deadlock handling

[8] Memory Management

Background, Logical versus Physical Address space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging

[9] Virtual Memory

Background, Demand Paging, Performance of Demand Paging, Page Replacement, Page-replacement algorithms, Allocation of frames, Thrashing, Other Considerations, Demand segmentation

[10] File-System Interface

File concept, Access methods, Directory Structure, Protection, Consistency semantics

[11] File-System Implementation

File-System Structure, allocation methods, Free-space Management, Directory Implementation, Efficiency and performance, Recovery

[12] I/O Systems

Overview, I/O H/W, Application I/O interface, Kernel I/O subsystem, Transforming I/O Requests to H/W operations. Performance

[13] Secondary-Storage Structure

Disk Structure, Disk scheduling, Disk Management, Swap-space management, Disk reliability

[14] Distributed System Structures

Network operating Systems, Distributed Operating Systems, Remote services, Robustness, Design issues

[15] Distributed File Systems

Features of good DFS, Naming and Transparency, Remote File Access, Stateful Versus stateless service, File replication, Example systems

[16] Case studies on:

- UNIX operating system
- LINUX operating system
- Windows NT

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Operating Systems, internals and design principles by William Stallings, PHI
2) Operating System Concepts : Silberschatz, Galvin, Addison Wesley.
3) Modern Operating System : Design and Implementation Tanenbaum, PHI
4) Operating system Concepts : Milan Malinkovic, TMI

D. COURSE OUTCOME

After completion of the course students will develop

- Ability to understand detailed concepts of operating systems
- Detailed understanding of the ways in which processes are handled by the operating system
- Ability to understand and analyze different aspects of memory management
- In depth knowledge of file system structures, disk operations and various algorithms related to operating systems.

B. TECH. SEMESTER – V (CE)

SUBJECT: ADVANCED ALGORITHMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5.0	60	40	25	25	150

A. COURSE OBJECTIVE

The subject focuses on Advancement in Algorithms along with its applicability and time complexity. It discusses pattern searching algorithms. Geometric algorithms highlight how to find convex Hull from the set of points in the 2-D plane and how to check intersection of two line segments in air-line traffic control. It elaborates the importance of Approximate algorithms for industry problems where exact solution is not possible. Objective of Theory of reduction is to use solution of one problem for another problem.

B. DETAILED SYLLABUS

[1] Randomized Algorithm

Probability and random variables, Probabilistic analysis, Randomized algorithms, Monte Carlo Algorithm, Las Vegas Algorithm, Primality Testing algorithms.

[2] Flow Network

Max Flow Problem, Max Flow - Min Cut duality, Ford Fulkerson Algorithm, Various algorithms to solve Max-Flow problem, Applications of Network Flow problems.

[3] String Algorithms

Naive String Matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm

[4] Computational Geometry

Line-Segment properties, Determine intersection between line segments, Finding Convex Hull, Finding Closest pair of points.

[5] Reduction

Theory of reduction, Linear time reduction, Polynomial time reduction, Identifying lower bound using reduction

[6] NP-Hard and NP-Complete Problems

Unsolvable problem classes, NP-Hard Problems, Proving a problem NP-Hard, NP-Complete Problems, NP-Completeness proof

[7] Linear Programming :

Standard and slack form, Formulating problem as linear programs, The simplex algorithm, Duality, basic feasible solutions.

[8] Approximation Algorithm

Approximation technique to solve hard problems, randomization and linear programming based approximation, Polynomial time approximation

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Introduction to Algorithms, Thomas H. Corman, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, Third addition, PHI Learning private ltd.
2) Fundamentals of computer algorithms, Second Edition, Ellis Horowitz, Sartaj Sahni, S. Rajasekaran, Universities Press
3) Fundamentals of Algorithmics, Gilles Brassard, Paul Bratley, PHI Learning private ltd
4) Algorithm Design, Pearson/Addison-Wesley, Jon Kleinberg, Eva Tardos, Addison-Wesley

D. COURSE OUTCOME

- The students will be able to interpret and be able to apply the algorithms in various ways to solve industry problems
- Students can do performance comparisons of various algorithms for the same problem
- Students can do Mathematical model formulation of the industry problem using the principles of Operation Research
- Students can think in the direction of an approximate solution when the exact solution is hard or impossible to achieve

B. TECH. SEMESTER – V (CE)

SUBJECT: ADVANCED TECHNOLOGIES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
3	1	2	6	5.0	60	40	25	25	150

A. COURSE OBJECTIVE

- To learn front-end and single-page application development using JavaScript based frameworks e.g. Angular and React.js.
- To learn back-end development and RESTful services using Node.js, Express.js and Spring-boot framework.
- To learn the design and use of NoSQL databases as the back-end e.g. MongoDB.
- To learn TDD based web application development.

B. DETAILED SYLLABUS

[1] JavaScript:
Fundamentals, functions, objects, prototypes, inheritance, classes, promises, async/await, generators, modules, DOM manipulation.

[2] Node.js:
Introduction, architecture, callbacks, event loop, built-in modules (http, fs, url), events, buffers, streams, mongoose ODM.

[3] Express.js
Introduction, routing, HTTP methods, url building, middleware, cookies, sessions, RESTful API.

[4] MongoDB
Introduction, pros and cons, types, comparison with RDBMS., database design, queries, projection, indexing, aggregation, replication and sharding.

[5] TypeScript:
Introduction, types, variables, operators, functions, strings, arrays, tuples, union, interfaces, classes, objects, namespaces, modules.

[6] Angular:
Introduction, architecture, components, modules, directives, data and event binding, templates, pipes, forms, routing, dependency injection, services, testing.

[7] React.js:
Introduction, ES6, JSX, components, state, lifecycle, props, forms, events, refs, keys, router, flux, redux

[8] Spring-Boot:
Introduction, RESTful web service development, Exception handling, Testing services using Postman tool.

C. RECOMMENDED TEXT / REFERENCE BOOKS

RECOMMENDED TEXT BOOKS:

1) "Pro Angular" by Adam Freeman, 3rd Edition, Apress Publication
2) "Beginning Node.js, Express and MongoDB Development" by Greg Lim
3) "MongoDB in Action" by Kyle Banker, Peter Bakkum, et al., 2nd Edition, Manning Publication
4) "Beginning jQuery: From the Basics of jQuery to Writing your Own Plug-ins" by Jack Franklin and Russ Ferguson, 2nd Edition, Apress publication
5) "Learning React: Functional Web Development with React and Redux" by Alex Banks and Eve Porcello, O'reilly Publication
6) "Spring Microservices in Action" by John Carnell and Illary Huaylupo Sánchez, 2nd Edition, Manning Publication.

REFERENCE BOOKS

1) "Node.js in Action" by Alex Young, Bradley Meck et al., 2nd Edition, Manning Publication
2) "Pro React 16" by Adam Freeman, 1st Edition, Apress publication
3) "React Quickly: Painless web apps with React, JSX, Redux, and GraphQL" by Azat Mardan, Manning Publication

D. COURSE OUTCOME

At the end of the course, the students should be able to:

- Use of JavaScript for DOM manipulation inside browsers. Use of Spring boot to develop RESTful web services.
- Use Node.js, Express.js and MongoDB to develop the RESTful services.
- Use TypeScript and Angular framework to develop single-page applications.
- Use React.js framework to develop the front-end of web applications.

B. TECH. SEMESTER – V (CE)

SUBJECT: SMART DEVICE PROGRAMMING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	1	2	3	2.0	-	-	25	25	50

A. COURSE OBJECTIVE

The Objective of this course is to expose students to programming of various smart devices. This will help students to use the computational power of ubiquitous smart devices to solve real world problems. This will help students to create applications which can easily reach masses. Students will be able to write code once and use the same code to create applications for different platforms.

B. DETAILED SYLLABUS

[1] Programming Framework

Introduction to Dart programming language and Flutter framework. Installation of Flutter

[2] DART - Programming

Data types, variables, operators and decision making (branching and looping)

[3] DART - Programming

Functions and classes, Nullability and Collections

[4] Dart – Programming

Asynchronous programming, concurrency and unit testing

[5] FLUTTER

Introduction to Widgets, Layouts and gestures, State management

[6] FLUTTER

Connectivity with the database and automated testing, Packages and access to REST APIs

[7] FLUTTER

Controlling smart devices (like lamp or fan) using applications developed with the Flutter framework. Deployment of the Flutter application.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Dart Apprentice, first edition, by Jonathan Sande & Matt Galloway
2) Quick Start Guide to Dart Programming, by Sanjib Sinha, Apress
3) Beginning App Development with Flutter, by Rap Payne, Apress

4) Flutter Apprentice, by Kevin D Moore, Michael Katz and Vincent Ngo

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Write programs using Dart programming language
- Develop applications using Flutter framework for android, ios, macos, windows and linux platforms
- Connect to database and access REST APIs from application developed using Flutter
- Write automated test cases for testing their Flutter code and be able to deploy their application on various platforms
- Control smart hardware devices like lamps and fans from Flutter application

B. TECH. SEMESTER – VI (CE)

SUBJECT: NETWORK & INFORMATION SECURITY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5.0	60	40	25	25	150

A. COURSE OBJECTIVE

- To make students aware about the goals and issues of network and information security
- To teach various security algorithms and necessary mathematical concepts
- To make students aware about how to enhance the security while transmitting data over network and how security at different layers of Network Model are required to realize the overall security

B. DETAILED SYLLABUS

[1] Conventional Encryption

Conventional Encryption Model, Steganography, Classical Encryption Techniques

[2] Conventional Encryption Techniques

Simplified Des, Block Cipher Principles, Data Encryption Standards, Differential And Linear Cryptography Principles, Block Cipher Design Principles, Modes Of Operations, Algorithms Like Triple Des, International Data Encryption Algorithm, Blowfish, Rc5, Cast-128, Rc2, Characteristics Of Advanced Symmetric Block Cipher, Issues Of Conventional Encryption Like Traffic Distribution, Random Number Generation, Key Distribution

[3] Public Key Cryptography

Principles Of Public-Key Cryptography, RSA Algorithm, Key Management, Elliptic Curve Cryptography, Diffie-Hellman Key Exchange

[4] Number Theory

Prime And Relatively Prime Numbers, Modular Arithmetic, Euler‟s Theorem, Euclid‟s Algorithm, Discrete Logarithm Tics

[5] Message Authentication And Hash Functions:

Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security Of Hash Functions And Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Ripemd-160, Hmac

[6] Introduction To E-Commerce:

Introduction To E-Commerce, Transactions On E-Commerce, Requirement Of Security On E-Commerce

[7] Network Security

Digital Signatures, Authentication Protocols, Digital Signature Standards, Application

Authentication Techniques Like Kerberos, X.509 Directory Authentication Services, Active Directory Service Of Windows NT/Windows 2000

[8] IP Security EMail Security

IP Security Overview, Architecture, Authentication Header, Encapsulation Security Payload, Combining Security Association, Key Management, Pretty Good Privacy, S/Mime And Types

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Cryptography And Network Principles And Practice Fourth Edition, William Stallings, Pearson

D. COURSE OUTCOMES

- Students will be able to understand basic Mathematical foundations required for various security mechanisms.
- Students will be able to use cryptographic algorithms to make their applications secure against network security threats
- Students will be able to analyze the security aspects and will be able to choose correct security mechanism and relevant algorithms for implementation
- Students will be able to use the concepts/algorithms to advance his/her career as network security engineer

B. TECH. SEMESTER – VI (CE)

SUBJECT: ADVANCED COMPUTER ARCHITECTURE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Pract.	Total
4	0	2	6	5.0	60	40	25	25	150

A. COURSE OBJECTIVE

- To get familiarity with 8087 Math Coprocessor and Maximum mode of 8086
- To understand advanced processor architectures like 80286, 80386 and Protected Virtual Addressing Mode, segmentation,paging.
- To understand Parallel Processing techniques like loop splitting, expression splitting using shared memory and multiple processes
- To learn about pipelining, its issues and solutions, parallel processor architectures.
- To learn Parallel algorithms like Bitonic sorting, Gauss Elimination for solving system of Linear equations and to evaluate performance of the algorithms

B. DETAILED SYLLABUS

[1] 8086 Maximum Mode Operation, Signal Description, 8087 Math Coprocessor, Architecture of 8087 Floating Point Processor, Pin Functions of 8087,Register Set-Control Word Register, Status Word Register, Tag Word Register, Stack Registers, Instruction Set and Programming.

[2] 80286 Processor Architecture, Pin Functions, Register set-Programmer Invisible Registers, Features of 80286, Real Addressing Mode, Protected Virtual Addressing Mode-Protection Level Mechanisms for Code and Data, Segmentation in Protected Mode, Instruction Set and features of 80287.

[3] 80386 Processor Architecture, Pin Functions, Register set-General Purpose, Debug Registers, Test Registers, EFLAG, Control Registers Features of 80386, Real Addressing Mode, Protected Virtual Addressing Mode-Protection, Multitasking, Interrupt Handling, Segmentation, Paging Mechanism in PVAM, Instruction Set, Addressing Mode, Virtual 8086 Mode.

[4] Features of 80486 Processor, Cache Types-L1, L2 cache, TLB, M-Way Set Associative Cache Organization, Differences between 80386 and 80486. Pentium Processor Architecture and Features, Memory Management Unit of Pentium, New Instructions of Pentium, Features of Pentium PRO, Pentium2 and Pentium 4.

[5] Parallel Processing

Introduction, Different Types of Parallelism, Pipelining, Hazards-Structural, Data, Control hazard, Super-pipelining, Super Scalar Architecture, BTB(Branch Target Buffer), BPB(Branch Prediction Buffer), Distributed Memory, Shared Memory, Symmetric Multiprocessing, Array Processors, Vector Processors, Systolic Arrays.

[6] Programming using Shared Memory

[7] Loop Splitting, Self Scheduling, Contention or Race Conditions in Parallel Computing, Solution to Contention using Spin Locks, Expression Splitting, Indirect and Block Scheduling, Barriers.

[8] Parallel Algorithm Design and Analysis- Sorting, Searching, Matrix Multiplication, Solving System of Linear Equations etc.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) INTEL MICROPROCESSORS 8086/8088, 80186/80188, 80286, 80386, 80486, PENTIUM AND PENTIUM PRO PROCESSOR BY BARRY B. BREY
2) Walter A. Tribal, The 80386, 486 and Pentium Processor
3) "Parallel Computers Architecture and Programming", V.Rajaraman, C. Siva Ram Murthy, PHI, New Delhi
4) Parallel Processing By Stevens Brawer
5) Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar "Introduction to Parallel Computing", Second Edition, Addison Wesley, 2003. ISBN: 0-201-64865.
6) Advance Microprocessor and Peripherals –by A K RAY, K M BHURCHANDI, Second-Edition, The McGraw-Hill
7) S.G.Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.
8) F.T.Leighton, "Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes", MK Publishers, San Mateo California, 1992.
9) Wilkinson, M.Allen,"Parallel Programming Techniques and Applications using networked workstations and parallel computers", Prentice Hall, 1999.
10) Michael J. Quinn, "Parallel computer theory and practice", McGraw Hill, Second Edition, 1994

D. COURSE OUTCOME

- To be able to make programs using instructions of 8087
- To learn and implement shared memory multi-programming
- To learn about advanced processor architectures
- To learn about MPI (Message passing Interface) library and to make programs using that.
- To learn, analyze working of Parallel Algorithms and its issues, limitations, overheads etc.

B. TECH. SEMESTER – VI (CE)

SUBJECT: THEORY OF AUTOMATA AND FORMAL LANGUAGES

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	0	4	4.0	60	40	-	-	100

A. COURSE OBJECTIVE

Students will learn:

- Mathematical Proof Techniques
- Various models of Computation
- Basics of Parsing

B. DETAILED SYLLABUS

[1] Review of Mathematical background

Sets, functions, logical statements, proofs, relations, languages, Mathematical induction, strong principle, Recursive definitions

[2] Regular Languages and Finite Automata

Regular expressions, regular languages, applications, Finite automata, memory requirement in a recognizer, definition, representation, extended notation, string recognition, union, intersection and complement of regular languages. Non- deterministic finite automata, lambda transitions, equivalence, algorithms, examples. Kleen's theorem. Minimization of Finite automata. Non-regular and regular languages, criterion, Pumping Lemma, decision problems and decision algorithms, Regular languages in relation to programming languages.

[3] Context-Free Languages and Push-Down Automata

Context-free languages, definition, union, concatenation, examples etc. derivation tree and ambiguity. Simplified and Normal forms, Chomsky normal form. Push-Down Automata, definition, examples, deterministic PDA, two types of acceptances and their equivalence. Equivalence of CFG and PDA. Introduction to parsing, top-down and bottom-up parsing. Non-CFL and CFL, Pumping Lemma for CFL, intersection and complement.

[4] Turing Machines

Models of computation, TM definition, combining TMs, computing a function with TMs. variations on Turing Machines, doubly infinite and more than one Tapes, non- deterministic and Universal TM, Recursively Enumerable languages, Unrestricted and context-sensitive grammars and their relation to TM, Linear Bounded Automata, Chomsky hierarchy, Unsolvable problems, Halting problem, Post's correspondence, applications to CFLs. Computability, Primitive recursive functions, computable functions, PR functions, bounded operations. Non- primitive recursive functions.

[5] Introduction to Computational complexity

Tractable problems, growth rate, time complexity of TM. NP-completeness

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "Introduction to Languages and Theory of Computation", John C. Martin, McGraw-Hill
2) "Computation : Finite and Infinite", Marvin L. Minsky, Prentice-Hall

D. COURSE OUTCOMES

- Students will be able to prove theorems using Principles of Mathematical Induction
- Students will be able to build models for various formal languages
- Students will be able to understand evolution of computational theory based on the models of computation
- Students will be able to understand how syntax checking works
- Students will understand importance of deterministic and non-deterministic model

B. TECH. SEMESTER – VI (CE)

SUBJECT: WEB SERVICE DEVELOPMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	2	4	3.0	40	-	25	25	90

A. COURSE OBJECTIVE

The objective of this course is to familiarize the students with the concepts and principles of service orientation. We aim to cover SOAP-based and RESTful web services and to guide the students to implement them. The course will give detailed knowledge of concepts of micro-services architecture and make students aware about the concepts of application containers.

B. DETAILED SYLLABUS

[1] Principles of Service Orientation

Common principles, interrelation between principles, comparing service orientation with object orientation.

[2] Web services

Web Services roles, Service Descriptions with WSDL and Messaging with SOAP, UDDI basics. Web service coordination, orchestration, and choreography. Windows Communication Foundation: Introduction, Operations, Service, data and message contracts.

[3] Web API

Introduction, controller, configuration, routing, parameter binding, action return type, media type formatters. message handlers, action filters, CRUD operation, Http client to consume Web API, dependency injection.

[4] Micro services

Introduction, architecture, features, monolithic vs. microservices, principles, advantages.

[5] Containers

Introduction, creation, configuration, commands. e.g. Docker, Podman, Coordinating containerized applications: Introduction, architecture, components, commands, configuring cluster. e.g. Docker Swarm, Kubernetes

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Pearson Education.

2) Tugberk Ugurlu, Alexander Zeitler and Ali Kheyrollahi, “Pro. ASP .NET Web API”, Apress.
3) Sam Newman, “Building Microservices”, O’Reilly.
4) Sean P. Kane and Karl Matthias, “Docker: Up & Running”, O’Reilly.
5) Brendan Burns and Kelsey Hightower, “Kubernetes: Up and Running” , O’Reilly.
6) Kurtz, Jamie, Wortman, Brian, “ASP.NET Web API 2: Building a REST Service from Start to Finish”, Apress.
7) Ronnie Mitra and Irakli Nadareishvili, “Microservices: Up and Running”, O’Reilly.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Understand service orientation concepts and principles.
- Design and develop service oriented applications in standard manner
- Develop SOAP based and RESTful web services.
- Design and development of microservices and containers

B. TECH. SEMESTER – VI (CE)

SUBJECT: MACHINE LEARNING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
3	1	2	6	5.0	60	40	25	25	150

A. COURSE OBJECTIVE

Learn basic principles and techniques of machine learning. Develop ability to solve real world problems which requires computational intelligence

B. DETAILED SYLLABUS

[1] INTRODUCTION

Overview ,Supervised and unsupervised learning, Learning task, instances, features, labels, reward/loss, training, testing

[2] CLASSIFICATION

Overview of classification: setup, training, test, validation dataset, overfitting.

Decision Tree : Purity, Gini index, entropy, Algorithms for constructing a decision tree, Pruning methods to avoid over-fitting, Regression trees

Naive Bayes Classifier: Basics of Probability, Generative classifiers: Naive Bayes classification, Conditional classifier: Logistic

Support Vector Machine: Support Vectors, max margin classifier, primal and dual form, slack variables, kernel tricks.

[3] CLUSTERING

Unsupervised Learning, Mixture model and Expectation maximization, K-Means Clustering,Distance based clustering, Density based clustering techniques, Hierarchical clustering.

[4] REGRESSION

Introduction, Linear Regression, Logistic Regression, Performance evaluation

[5] NEURAL NETWORK

Introduction, Perceptron, Multilayered Feed Forward Neural Networks, Gradient Descent Technique, Back propagation Algorithm.

[6] DEEP LEARNING

Introduction, Convolutional Neural Networks, Building blocks of Convolutional Neural Network, Transfer Learning. Recurrent Neural Networks, LSTM Network. Encoder-decoder, Transformer, pre-trained models

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Machine Learning. T. Mitchell. McGraw-Hill, 1997.
2) Pattern recognition and machine learning by Christopher Bishop, Springer Verlag,2006
3) Deep Learning, Ian Goodfellow, Yoshua Bengio, & Aaron Courville, MIT Press

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Understand various supervised and unsupervised learning algorithms.
- Ability to analyze performance of Machine Learning algorithms.
- Understand the mathematical foundation required for solving problems using machine learning techniques.
- Ability to apply various machine learning techniques to solve real world problems.

B. TECH. SEMESTER – VI (CE)

SUBJECT: COMPUTER NETWORKS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5.0	60	40	25	25	150

A. COURSE OBJECTIVE

- To develop an understanding of modern network architectures from a design and performance perspective.
- To develop an understanding of different components of computer networks, various protocols, technologies and their applications.

B. DETAILED SYLLABUS

[1] Introduction

Uses of computer Networks, Network Hardware-LAN,MAN,WAN, internetworks. Network Software - Design Issues, interfaces & Services, Connection Oriented & Connectionless services. Service primitives. Relationship of services to protocols. Reference Models - OSI & TCP/IP, their comparison & critiques.

[2] The Physical Layer

Transmission Media – magnetic media, twisted pair, baseband & broadband, fiber optics. Wireless Transmission – radio, microwave, infrared & lightwave. Narrowband ISDN, Broadband ISDN & ATM. Cellular Radio- Paging systems, cordless telephones, analog & digital telephones.

[3] The Data Link Layer

DLL Design issues, Error Detection & Correction. Elementary Data link Protocols - Utopia, Stop N Wait, Automatic Repeat Request. Sliding Window Protocols - 1 bit sliding window, Go Back N, Selective Repeat Protocols.

[4] Medium Access Sublayer

Channel Allocation Problem - Static & Dynamic. Multiple Access protocols - ALOHA, CSMA, Collision Free Protocols, Limited contention protocols, WDMA protocol, wireless LAN protocols. IEEE standards 802 for LAN & MAN - 802.2, 802.3, 802.4, 802.6 & related numericals. Bridges - From 802.x to 802.y, transparent Bridges, Spanning Tree, Source Routing Bridges, remote bridge & problems. Comparison of 802 bridges, High Speed LANs - FDDI, fast ethernet.

[5] The Network Layer

Network layer Design issues. Routing Algorithms. Congestion Control Algorithms - general policies, congestion prevention policies, traffic shaping, flow specifications, congestion control in VC subnets, choke packets, load shedding, jitter control and congestion control for

malfunctioning. The network layer in the internet - the IP protocol, IP addresses & subnets

[6] The Transport Layer

The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols - TCP service model, TCP protocol, TCP Segment Header, TCP Connection Management, TCP Transmission Policy, TCP Congestion Policy. UDP & overview of Socket. Performance Issues - Performance problems in Computer Networks (case study), Measuring Network Performance (case study).

[7] The Application Layer

Network Security - Traditional Cryptography, Two Fundamental Cryptographic Principles, Secret-Key Algorithms, Public- key Algorithms, Authentication protocols, Digital Signatures, Social Issues., E-mail (case study), SNMP (case study).

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Computer Networks - Andrew Tanenbaum, 3ed, PHI
2) Data & Computer Communications - William Stallings, 2ed, Maxwell Macmillan Int.
3) Communication Networks, Fundamental Concepts & key Architecture - Leon-Garcia & Widjaj, Tata-McGraw Hill

D. COURSE OUTCOMES

At the end of the course, students will be able to

- Analyze and troubleshoot various network parameters.
- Understand functionality of network devices.
- Comprehend functionality of various protocols and algorithms.
- Design basic computer network configurations.
- Recognize the technological trends of Computer Networking.

B. TECH. SEMESTER – VI (CE)

SUBJECT: SYSTEM DESIGN PRACTICE (MINI PROJECT)

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	1	2	3	2.0	-	-	25	25	50

A. COURSE OBJECTIVE

Understand how to use Software Process life cycle in the development of the complete software.

B. DETAILED SYLLABUS

- Students at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses. Students will work together in a team (at most three) with any programming language.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work on a weekly basis to the respective internal guide.
- Project will be evaluated at least once per week in laboratory Hours during the semester and final submission will be taken at the end of the semester as a part of continuous evaluation.

C. RECOMMENDED TEXT / REFERENCE BOOKS

Not applicable

D. COURSE OUTCOMES

- Students will be able to identify, analyze and define the scope of the project.
- They will decide suitable tools and technologies required for project development.
- Students will learn how to apply OOPS concepts, draw UML diagrams and perform black-box and white box testing.
- Students will be able to decide suitable User-interface for their project

B. Tech. Semester VII

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Artificial Intelligence	4	0	2	6	5.0	60	40	25	25	150
Professional Elective III	4	0	2	6	5.0	60	40	25	25	150
Professional Elective IV	4	0	2	6	5.0	60	40	25	25	150
Open Elective III (Cloud Computing and IOT)	2	0	2	4	3.0	40	-	25	25	90
Compiler Construction	4	0	2	6	5.0	60	40	25	25	150
	18	0	10	28	23.0	280	160	125	125	690

B. Tech. Semester VIII

SUBJECTS	Teaching Scheme			Total	Credit	Examination Scheme (Marks)				
	Th	Tut	Pract			Th	Sess	TW	Prac	Total
Project/Industrial Training	0	6	24	30	18	0	0	150	350	500
	0	6	24	30	18	0	0	150	350	500

Professional Elective III & IV in 7th semester are offered from the list of the following subjects

Course Name	Category
Image Processing	PEC : CS-A
Big Data Analytics	PEC : CS-D
Knowledge Discovery	PEC: CS-D
Mobile Application Development	PEC : CS-A
Distributed Operating Systems	PEC : CS-S

B. TECH. SEMESTER – VII (CE)

SUBJECT: ARTIFICIAL INTELLIGENCE

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The main objective of this course is to make students aware about achievements and vast opportunities present in the fields of AI. The course covers three main facets of AI designing: Search Technique, Knowledge Representation and Learning. The course additionally covers advanced topics in the field such as Fuzzy Logic, Game Playing, Natural Language Processing, Evolutionary Computations and Expert Systems.

B. DETAILED SYLLABUS

[1] Introduction to Artificial Intelligence

Introduction problems, problem space, production systems, problem characteristics

[2] Search Techniques

Uninformed search techniques (best-first search, Depth-First search), Heuristic search techniques (General and test, Hill climbing, Simulated annealing, A* algorithm, Constraint satisfaction, Means-end-analysis) Adversarial search techniques (Game playing, MINIMAX algorithm, alpha-Beta pruning)

[3] Knowledge Representative

Propositional Logic, predicate logic, Instance and isa relationship, semantic net, frames.

[4] Fuzzy Logic

Definition, need fuzzy set, fuzzy operators, fuzzy control systems, limitations

[5] Inference techniques

Representing knowledge using rules, procedure versus declarative knowledge, forward versus backward reasoning, unification, resolution.

[6] Natural Language Processing

Introduction NLP, NLU, phase of NLP (Morphological analysis, syntactic analysis, semantic analysis, discourse integration), introduction to Machine Translation.

[7] Expert System

ES architectures, representation and use of domain knowledge, expert system shells, knowledge acquisition.

[8] PROLOG

Facts and predicate, data types, goal finding, backtracking, simple object, compound objects, use of cut and fail predicates, recursion, lists, simple input/output.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Artificial Intelligence by Elaine Rich and Kevin Knight, TMH
2) Introduction to Turbo PROLOG by Carl Townsend, BPB
3) Artificial Intelligence : A Modern Approach by Stuart Russell and Peter Norvig, PHI
4) Artificial Intelligence and Expert System by D.W. Patterson, PHI
5) Introduction to Applied Fuzzy Logic by Ahmed Abraham, PHI

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Understand conceptual and contextual meaning of AI and views of AI.
- Analyze and represent an AI problem
- Aware of several logic based techniques for knowledge representation and inference.
- Create interactive programs using declarative programming language PROLOG.
- Represent problems with uncertain information with the use of fuzzy logic representation and solve using fuzzy inference mechanisms.
- Design intelligent systems using Game Playing, Expert Systems and Evolutionary algorithms

B. TECH. SEMESTER – VII (CE)

SUBJECT: IMAGE PROCESSING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The objective of the course is to understand image formation and representation. To Learn various enhancement and restoration techniques in different domains. To learn about the various compression techniques.

B. DETAILED SYLLABUS

[1] Introduction

Digital Image, Applications of Digital Image Processing in Electromagnetic Spectrum, Fundamentals steps in Digital Image Processing, Components of an Image Processing System.

[2] Image Transformation and Spatial Filtering

Fundamentals, Basic intensity transformation functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining spatial enhancement methods.

[3] Image Transformation in Frequency Domain

Preliminary concepts, Sampling and the Fourier transform of sampled functions, DFT of one variable, extension to functions of two variables, Translation, rotation and periodicity properties of 2D-DFT, the basics of filtering in frequency domain, Smoothing and Sharpening using frequency domain filters, Selective filtering.

[4] Image Restoration Methods

Image Degradation/Restoration Model, Noise Models, Spatial Filtering in the presence of Noise

[5] Morphological Image Processing

Erosion and Dilation, Opening and Closing, Hit-or-Miss Transform, Basic Morphological Algorithms

[6] Image Compression Techniques

Fundamentals, Some Basic Compression Methods

[7] Image Segmentation Schemes

Fundamentals, Point, Line and Edge detection, Thresholding, Region-based segmentation.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) R.C.Gonzalez and R.E.Woods, "Digital Image Processing", Addison-Wesley Longman, Inc, 1999

2) A.K.Jain, "Digital Image Processing", PHL

3) M.Sonka, V.Hlavac, and R.Boyle – Image processing, Analysis and Machine vision, Thomson Asia pvt. Ltd, 1999.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Apply various enhancement and restoration techniques in both spatial and frequency domain.
- Decide which technique would be suitable for a given application.
- Make decisions based upon the requirement which compression technique to apply.
- Segment the images for further processing

B. TECH. SEMESTER – VII (CE)

SUBJECT: BIG DATA ANALYTICS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The objective of the course is to understand digital data, data preprocessing, data warehousing and various supervised and unsupervised algorithms. Students will learn big data, sources of big data and various platforms to handle big data. They will also learn HADOOP and its components.

B. DETAILED SYLLABUS

[1] VARIOUS SOURCES AND TYPES OF DATA

Structured, Semi-Structured, Unstructured data. Human vs Machine generated data. Data Objects and Attribute Types - Nominal, Binary, Ordinal, Numeric. Data at rest vs data in motion. Handling data traditionally using RDBMS and Data Warehouses and the nature of co-existence and purpose. Various File formats and purposes. Issues with unstructured data.

[2] INTRODUCTION TO BIG DATA

Big Data definition by Gartner, Data importance - quotes, Characteristics of Big Data (Many Vs), Data Orchestration, Data modeling, Big Data Security and Privacy (IT Act), Data silos vs Data lakes. Big data in various domains, top challenges.

[3] HANDLING OF DATA

Data pre-processing, ETL processes, Concept hierarchy, Data cleaning with missing values, noisy data, outliers. Dark data and social impact of data mining. Import/export, data dump. Schema on read vs Schema on write.

[4] BIG DATA AND ANALYTICS

Types of analytics. Fundamental operations such as mean, mode, median, five-number summary, Central tendency. Commerce and Big Data Analytics: Customer Churn Rate, Serial Returner, Market Basket Analysis, Promotions/Coupons, Importance of right question for right data, Analytics and Industry Revolutions. Attribute Oriented Induction. Time series Analysis, Data summarization techniques, Sequence Pattern Mining, GSP- Generalized Sequential Pattern Mining, SPADE-Sequential Pattern Discovery using Equivalence Class.

[5] THE BIG DATA TECHNOLOGY LANDSCAPE

Horizontal vs vertical scaling, Similarity/difference between master-worker and client-server architecture, SQL , NoSQL and NewSQL, CAP Theorem, ACID and BASE. Role of big data analytics IoT-Cloud-ML and technology development.

[6] HADOOP - INTRODUCTION TO ECOSYSTEM

Hadoop and the movement, features, versions, advantages, overview of Hadoop ecosystem, hadoop high level architecture.

[7] HADOOP – DISTRIBUTED FILE SYSTEM AND PROCESSING

Locality of reference, Moving code to data. Function as first class citizen, HDFS, Anatomy of File Read, Anatomy of File Write, Replica placement strategy, HDFS commands, Hadoop cluster modes, Programming paradigm - structured, oop, functional, map-reduce. Phases of map-reduce, input and output types, partitioning, compression and archival with Hadoop, Tera sort and hadoop benchmarking. Replication factor. Administration and monitoring/control.

[8] BIG DATA SOLUTIONS

MongoDB: crud, aggregation and map-reduce operations, sharding. Cassandra: Features. Hive: architecture, Serde, Pig: Pig on Hadoop and wordcount. Various primitive/complex data types supported across tools. Spark: architecture, pyspark/spark-shell with scala, spark deployment options, ways to create RDD (parallelize, file read, from existing RDD and api), dataframe, transformation, action, lazy evaluation, repartitioning, coalesce. Purpose of DAG in lazy evaluation.

[9] DATA REPORTING AND TOOLS

Purpose, requirement, drivers, data connectors, integration of softwares, download and sharing techniques, overview of reporting tools community edition like JasperSoft, Tableau.

[10] THE REALM OF DATA SCIENCE

Anatomy of Data Science: Business Acumen, Maths and Technology Expertise, Citizen scientist, Trends in Analytics, Tumbling Windows Vs Sliding Windows - Windowing Protocol for stream data analytics. Trending applications.

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Big Data and Analytics – Seema Acharya and Subhashini C – Wiley India
2) Hadoop: The Definitive Guide by Tom White
3) Big Data Analytics: Methods and Applications by B. L. S. Prakasa Rao (Editor), S. B. Rao (Editor)
4) Data Mining - Concepts and Techniques by Jiawei Han, Michelin Kamber, Jian Pei.

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Learn various types of digital data and how to deal with them.
- Learn various data cleaning, data transformation, data reductions techniques
- Students will learn various supervised and unsupervised algorithms
- Understand big data, sources of big data, characteristics of big data
- Students will learn HADOOP and its components
- Learn concepts of mapreduce programming

B. TECH. SEMESTER – VII (CE)

SUBJECT: KNOWLEDGE DISCOVERY

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The objective of the course is to understand the digital data generated by various sources and to find implicit patterns from it which can be utilized for business intelligence. Students will be able to understand the problems in the digital data and will learn various data cleaning, data transformation, data reductions techniques. They will learn various machine learning algorithms to apply on the data which will help in decision making in industries.

B. DETAILED SYLLABUS

[1] Introduction

An overview of data warehousing and data mining

[2] Data Pre-processing

Overview, Need for pre-processing, Issues related to efficient data handling (Extraction, Transformation, And updating of large databases (ADDED) Data Cleaning, Data Integration & Transformation Data Reduction Discretization & Concept Hierarchy Generation

[3] Data warehouse and OLAP technology

Multidimensional Data Cubes, Star, SnowFlakes, & Fact Constellation Schema Concept Hierarchies, OLAP, Data Warehouse Architecture, Steps for design and construction of data warehouse, A 3-tier data warehouse architecture, ROLAP, MOLAP, HOLAP. Data Warehouse Implementation

[4] Mining Frequent patterns, Association and Correlation Logic

Basic Concepts, Item set mining methods, Mining association rules, Correlation analysis

[5] Classification & prediction

An Overview & Basic Concepts Classification by decision tree induction Bayesian Classification

[6] Cluster Analysis

An Overview & Basic Concepts Partitioning methods Hierarchical methods Density-Based methods Outlier analysis

[7] Graph Mining

Methods for Mining Frequent Subgraphs, Mining Variant and Constrained Substructure Patterns, Applications: Graph Indexing, Similarity Search, Classification and Clustering

[8] Mining Multimedia, Text, and Web Data

Multimedia Data Mining

- Similarity Search in Multimedia Data
- Multidimensional Analysis of Multimedia Data
- Classification and Prediction Analysis of Multimedia Data
- Mining Associations in Multimedia Data
- Audio and Video Data Mining

Text Mining

- Text Data Analysis and Information Retrieval
- Dimensionality Reduction for Text
- Text Mining Approaches

Mining the World Wide Web

- Mining the Web Page Layout Structure
- Mining the Web‟s Link Structures to Identify
- Authoritative Web Pages
- Mining Multimedia Data on the Web
- Automatic Classification of Web Documents
- Web Usage Mining

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Jiawei Han & Micheline Kamber, “Data Mining – Concepts & Techniques”,2nd edition, Morgan Kaufmann Publishers
2) Data mining: multimedia, soft computing, and bioinformatics By Sushmita Mitra, Tinku Acharya, published by John Wiley and Sons
3) Introduction to Data Mining. Tan, Steinbach, Kumar. Addison-Wesley. 2006.

D. COURSE OUTCOMES

At the end of the course students will :

- Be able to understand various sources of data generation and how to deal with heterogeneous data.
- Learn various data cleaning, data transformation, data reductions techniques.
- Learn various supervised and unsupervised algorithms
- Learn various outlier detection techniques
- Learn data warehousing concepts and they will also learn the concepts of text mining, web mining and multimedia miningDesign intelligent systems using Game Playing, Expert Systems and Evolutionary algorithms

B. TECH. SEMESTER – VII (CE)

SUBJECT: MOBILE APPLICATION DEVELOPMENT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The Mobile Application Development course is designed to teach students to develop mobile applications for the Android devices that use basic and advanced phone features. Students will also be able to deploy applications to the Android marketplace for distribution.

B. DETAILED SYLLABUS

[1] Getting started with mobility

Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development

[2] Building blocks of mobile apps

App user interface designing – mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity- states and life cycle, interaction amongst activities. Application functionality beyond user interface - Threads, Async task, Services – states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs. Native data handling – on- device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet)

[3] Sprucing up mobile apps

Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope)

[4] Testing mobile apps

Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, MonkeyTalk

[5] Taking apps to market

Versioning, signing and packaging mobile apps, distributing apps on mobile marketplace

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Android – Wireless Application Development by Lauren Darcey and Shane Conder, 3rd Ed., Pearson Education
2) Beginning Android Application Development by Wei-Meng-Lee, Wiley Publication
3) Professional Android 4 Application Development by Reto Meier, Wiley Publication

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Apply layout management and multi-layout definition techniques to create adaptable user interfaces for mobile applications that share a common data model.
- Manage user data and multimedia on a mobile device via the Android framework libraries.
- Use the sensors available on mobile devices to enhance user interaction and feedback.
- Publish Applications to the Google Play Store

B. TECH. SEMESTER – VII (CE)

SUBJECT: DISTRIBUTED OPERATING SYSTEMS

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

To give students knowledge of the principles, architectures, algorithms, programming models used in distributed systems. Also, to give detailed ideas on Distributed operating system concepts which includes Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.

B. DETAILED SYLLABUS

[1] Introduction to Distributed Systems
Classification of centralized operating system, network operating system, distributed operating system, and cooperative autonomous systems

[2] Interprocess Communication and Coordination
Communication models: message passing (socket), request-reply (RPC), transaction communication

[3] State Maintenance
Lamport's logical clock, vector clock, global state, cuts of a distributed system.

[4] Distributed Mutual Exclusion Algorithms
Non-token based algorithms, Token-based algorithms, Tree based algorithms

[5] Election Algorithms
Bully algorithm, Ring algorithm

[6] Fault Tolerance and Distributed Agreement
Commit protocols, Non-blocking commit protocols, voting protocols

[7] Database Techniques
Concurrency control algorithms, lock based and time-stamp based algorithms

[8] Check Point and Recovery
Synchronous and asynchronous checkpoint and recovery, checkpointing for DDBS

[9] Distributed Deadlock Detection
Centralized, Distributed and Hierarchical deadlock detection algorithms

[10] Load Balancing & Scheduling
Issues in load distributing, components of load distributing algorithm, load distributing algorithms

[11] Security
Private and public key cryptography

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) "Distributed Operating Systems and Algorithms" by Randy Chow and Theodore Johnson, Addison Wesley, 1997

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Understand issues of the Distributed Environment and different mechanisms to handle them
- Ability to demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- Gain understanding of the various resource management techniques for distributed systems
- Ability to summarize the major security issues associated with distributed systems along with the range of techniques available for increasing system security

B. TECH. SEMESTER – VII

SUBJECT: CLOUD COMPUTING AND IoT

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
2	0	2	4	3	40	-	25	25	90

A. COURSE OBJECTIVE

- To explain the components of the cloud infrastructure and their functions.
- To describe service models such as Software-as-a-Service, Platform-as-a-Service, Infrastructure-as-a-Service; and various deployment models of the cloud;
- To introduce the concepts of virtual machines, hypervisors, virtual networks.
- To understand about the fundamentals of Internet of Things and its building blocks along with their characteristics
- To understand the protocols and standards designed for IoT

B. DETAILED SYLLABUS

[1] INTRODUCTION TO CLOUD COMPUTING

- Overview of Computing
- Cloud Computing (NIST Model)
- Properties, Characteristics & Disadvantages
- Role of Open Standards

[2] CLOUD COMPUTING ARCHITECTURE

- Service Models (Iaas, Paas, Saas, XaaS)
- Deployment Models

[3] SERVICE MANAGEMENT IN CLOUD COMPUTING

- Service Level Agreements(SLAs) and related examples
- Cloud Economics and related examples

[4] VIRTUALIZATION

- Benefits of virtualization
- Types of virtualization
- Load balancing
- Hypervisors

[5] MANAGEMENT OF VIRTUAL MACHINES AND DATA

- Distributed management of virtual machines
- Scheduling techniques for advance reservation of capacity
- Capacity management to meet SLA commitments
- Looking at Data, Scalability & Cloud Services
- Large Scale Data Processing

[6] CLOUD SECURITY

- Infrastructure Security
- Data security and Storage
- Identity and Access Management

- Access Control, Trust, Reputation, Risk

[7] INTERNET OF THINGS

- Introduction to IoT
- IoT architecture
- IoT challenges

[8] NETWORKING PROTOCOLS FOR IOT

- MQTT
- COAP

[9] COMMUNICATION PROTOCOLS FOR IOT

- Zigbee
- 6LoWPAN
- RFID

[10] SOFTWARE DEFINED NETWORK (SDN)

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010.
2) Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010
3) "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)

D. COURSE OUTCOMES

At the end of the course, students should be able to:

- Students will be able to explain the core concepts of the cloud computing paradigm
- Students will be able to understand virtualization and outline its role in enabling the cloud computing system model
- Students will be able to analyze various cloud computing service models and deployment models.
- Understand the concept of Cloud Security.
- Students will be able to understand building blocks of Internet of Things and characteristics
- Students will be able to understand various protocols and standards designed for IoT

B. TECH. SEMESTER – VII (CE)

SUBJECT: COMPILER CONSTRUCTION

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
4	0	2	6	5	60	40	25	25	150

A. COURSE OBJECTIVE

The objective of this course is to get familiar with the different phases of a compiler, to learn algorithms for parsing and their usefulness in semantic analysis. This course will help to realize the need of run time environment support, symbol table organization, garbage collection, various machine independent code optimization techniques etc. Also, the course involves developing programs using LEX and YACC.

B. DETAILED SYLLABUS

[1] Introduction
Language processor, Structure of compiler, the science of building compilers, Applications of language processors

[2] Lexical analysis
The role of lexical analyzer, input buffering, specification of tokens, recognition of tokens, lexical analyzer generator (lex)

[3] Syntax analysis
Top-down parsing, Bottom-up parsing, Introduction to LR parsing, More powerful LR parsers, Using ambiguous grammars, Parser generators (yacc)

[4] Syntax directed translation (SDT)
Syntax directed definitions (SDD), Evaluation order of SDD‟s, Applications of SDT, SDT schemes

[5] Intermediate code generation
Variants of syntax tree, three-address code, types and declarations, translation of expressions, type checking

[6] Runtime Environments
Storage organization, stack allocation of space, access to non-local data on the stack, heap management

[7] Code generation
Issues in the design of code generator, the target language, addresses in the target code, basic blocks and flow-graphs, optimization of basic blocks, peephole optimization, register allocation and assignments

C. RECOMMENDED TEXT / REFERENCE BOOKS

1) Compiler: Principles, techniques and tools by Aho, Ullman and Sethi, 2nd Ed., Pearson

Education

2) Theory and Practice of Compiler Writing, Jean-Paul Tremblay, Paul G. Sorenson, McGraw Hill

D. COURSE OUTCOMES

- To know how a compiler tokenizer, parses the input program and how different phases of the compiler are involved.
- To be able to develop programs using LEX (Tool for Automatic Lexical Analyzer) and YACC (tool for Automatic Parser Generator).
- Understanding how different code optimization techniques reduce time or space required for the runtime.
- Understanding the semantic aspects of compilation like how type insertion, checking, code generation etc. can be done

B. TECH. SEMESTER – VIII (CE)

SUBJECT: PROJECT/INDUSTRIAL TRAINING

Teaching Scheme (Hours/Week)				Credits	Examination Scheme				
Lect	Tut	Prac	Total		Ext	Sess.	TW	Prac	Total
0	6	24	30	18	-	-	150	350	500

The students will undertake project work for the period of the full semester. They should design/develop the hardware and/or software system. They may also undertake projects involving study and analysis of hardware and system in the organization.

They are supposed to prepare and submit a project report as a part of their term work and give seminars on their project work. The students may be sent to the industry / organization for their project and they are to timely report to the Institute regarding monitoring and necessary guidance. The faculties should arrange visits at the places of projects.
They should arrange for demonstration of the project work, if any. They are to be examined based on viva and/or demonstration. The main purpose of industrial training is to acquaint students with the administrative and organizational details of a company.

They should know what are the basic rules followed in a company and how an employee should behave and work in the company.