UNIVERSITYOFKOTA,KOTA

BACHELOROFCOMPUTERAPPLICATION(BCA)Exam.2023-24

(Course Code 5450)

(Applicable for students admitted in Session 2023-24)

1. Eligibility: The basic eligibility for admission to the course is 10+2 in any discipline with minimum 48% marks, 5% relaxation in marks will be given to the SC /ST/OBC (except creamy layer) / SOBC / PH candidates. The admission in the course is based on merit of XIIclass.Reservationpolicywillbeapplicableasperthestategovernmentrules.
2. Selection: Based on merit in qualifying examination.

COURSE OBJECTIVE

The objectives of BCA course are:
- To provide strong foundation in field of Computer Science and Applications.
- To prepare the students with exceptional skills of problem solving, communication and leadership skills.
- To facilitate overall understanding of the requirements of the subjects.
- To prepare the students to provide professional solutions to real time problems.
- To train future industry professionals.
- To impart comprehensive knowledge with equal emphasis on theory and practice.
- To keep the students up-to-speed on all the latest and cutting edge technologies.

PROGRAMME OUTCOME

- Acquire Knowledge of Computer Science, applications, theory and algorithm principles in the design and implementing computer based system.
- To provide thorough understanding of nature, scope and application of computer and computer languages.
- To develop interdisciplinary approach among the students.
- Exhibit clarity on both conceptual and application-oriented skills of Computing, programming for higher studies in Post Graduate programs.
- To Work in the IT sector as system analyst, software developer, web developer, software tester, network administrator, system administrator etc.
- To enhance the skills for working in public sector and Government organizations.
- For providing Technical skill based Education in Schools and Colleges.
- Student will able to know various issues, latest trends in technology development and thereby innovate new ideas and solutions to existing problems.

BCA SEMESTER WISE SCHEME

First Year

+	Serial Number, Code &Nomenclature of Paper			Duration of Exam	Teaching Hrs/ Week &Credit			Distribution of Marks			Min Pass Marks	
Year / Semester	Subject Code	Course Type	Nomenclature	Duration of Exam	L	P	C	Internal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess.
I Year I Sem.	BCA 1001 T	DCC	Introduction to Information Technology	3Hrs	4	…	4	30	70	100	12	28
	BCA 1002 P	DCC	Lab on Internet Applications	3Hrs	-	4	2	-	50	50	-	25
	BCA 1003 T	DCC	Problem Solving Through C-Programming	3Hrs	4	…	4	30	70	100	12	28
	BCA 1004 P	DCC	Lab on Problem Solving Through C-Programming	3Hrs	…	4	2	…	50	50	…	25
	BCA 1005 T	DCC	PC Software Package	3Hrs	4	…	4	30	70	100	12	28
	BCA 1006 P	DCC	Lab on PC Software Package	3Hrs	…	4	2	…	50	50	…	25
	BCA 1007 T	AEC	Hindi/English	1.5 Hrs	2	--	2	---	50	50	--	20
			Semester Total		14	12	20	90	410	500	--	
I Year II Sem.	BCA 2001 T	DCC	Basic Maths	3Hrs	4	…	4	30	70	100	12	28
	BCA 2002 T	DCC	D.B.M.S	3Hrs	4	…	4	30	70	100	12	28
	BCA 2003 P	DCC	D.B.M.S Lab	3Hrs	…	4	2		50	50	…	25
	BCA 2004 T	DCC	D.C.C.N	3Hrs	4	…	4	30	70	100	12	28
	BCA 2005 P	DCC	D.C.C.N Lab	3Hrs	…	4	2	…	50	50	…	25
	BCA 2006 P	DCC	Lab on Application Development using DBMS	3Hrs	-	4	2	-	50	50	-	25
	BCA 2007 T	AEC	Hindi/English	1.5 Hrs	2	--	2	---	50	50	--	20
			Semester Total		14	12	20	90	410	500	--	
			First year Total		28	24	40	180	820	1000		

SECOND YEAR

Year / Semester	Serial Number, Code &Nomenclature of Paper			Duration of Exam	Teaching Hrs/ Week &Credit			Distribution of Marks			Min Pass Marks	
	Subject type	Course Type	Nomenclature		L	P	C	Internal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess.
II Year III Sem.	BCA 3001 T	DCC	Data structures	3Hrs	4	…	4	30	70	100	12	28
	BCA 3002 P	DCC	Lab on Data structures	3Hrs	…	4	2	…	50	50	…	25
	BCA 3003 T	DCC	Digital Electronics and Computer Architecture	3Hrs	4	…	4	30	70	100	12	28
	BCA 3004 T	DCC	Programming in Python	3Hrs	4	…	4	30	70	100	12	28
	BCA 3005 P	DCC	Lab on Programming in Python	3Hrs	…	4	2	…	50	50	…	25
	BCA 3006 P	DCC	Lab on Minor project - I using Python	3Hrs	-	4	2	-	50	50	-	25
	BCA 3007 T	GEC	Environmental Studies	1.5 Hrs	2	--	2	---	50	50	--	20
	Semester Total				14	12	20	90	410	500	--	
II Year IV Sem.	BCA 4001 T	DCC	Operating systems	3Hrs	4	--	4	30	70	100	12	28
	BCA 4002 P	DCC	Lab on Linux Operating System	3Hrs	--	4	2	--	50	50	--	25
	BCA 4003 T	DCC	Software Engineering	3Hrs	4	--	4	30	70	100	12	28
	BCA 4004 P	DCC	Lab on Minor Project- II	3Hrs	--	4	2	--	50	50	--	25
	BCA 4005 T	DCC	Programming with Java	3Hrs	4	--	4	30	70	100	12	28
	BCA 4006 P	DCC	Lab on Programming with Java	3Hrs	--	4	2	--	50	50	--	25
	BCA 4007 T	GEC	Business Communication	1.5 Hrs	2	--	2	---	50	50	--	20
	Semester Total				14	12	20	90	410	500	--	
	Second year Total				28	24	40	180	820	1000		

THIRD YEAR

+	Serial Number, Code &Nomenclature of Paper			Durat ion of Exam	Teaching Hrs/ Week &Credit			Distribution of Marks			Min Pass Marks	
Ye ar / Seme ster	Subject Type	Cours e Type	Nomenclature		L	P	C	Interna l Assess.	Sem. Asse ss.	Total Mark s	Intern al Asses s.	Sem. Assess.
III Year V Sem.	BCA 5001T	DSE	Elective-I: E-Commerce	3Hrs	4	…	4	30	70	100	12	28
	BCA 5002T		Elective-I: MIS									
	BCA 5003P	DSE	Elective-I:Technical Paper presentation	3Hrs	-	4	2	-	50	50	-	25
	BCA 5004P											
	BCA 5005T	DSE	Elective-II: Web Technology	3Hrs	4	…	4	30	70	100	12	28
	BCA 5006T		Elective-II: Programing With PHP									
	BCA 5007P	DSE	Elective-II: Practical	3Hrs	…	4	2	…	50	50	…	25
	BCA 5008P											
	BCA 5009T	DSE	Elective-III:Cyber Security	3Hrs	4		4	30	70	100	12	28
	BCA 5010T		Elective-III: Information Security									
	BCA 5011P	DSE	Elective-III: Practical	3Hrs	…	4	2	…	50	50	…	25
	BCA 5012P											
	BCA 5013T	VAC	MulyaPravah	1.5Hr s	2	--	2	---	50	50	--	20
	Semester Total				14	12	20	90	410	500	--	
III Year VI Sem.	BCA 6001T	DSE	Subject-I:Elective: Artificial Intelligence	3Hrs	4	--	4	30	70	100	12	28
	BCA 6002T		Subject-I: Elective: Data Science									
	BCA 6003T	DSE	Subject-II:Elective: Cloud Computing	3Hrs	4	--	4	30	70	100	12	28
	BCA 6004T		Subject-II: Elective: Data Warehousing									
	BCA 6003P	DSE	Subject-II: Elective: Practical	3Hrs	--	8	4	--	100	100	--	50
	BCA 6004P											
	BCA 6005P	DSE	Major Project	3Hrs		12	6	50	100	150	20	40
	BCA 6006T	SEC		1.5Hr s	2	--	2	---	50	50	--	20
	Semester Total				10	20	20	110	390	500	--	
	Third year Total				24	32	40	200	800	1000		
	Three Year Degree Total				78	80	120	560	2440	3000		

EXAMINATION AND ASSESSMENT

There are two category of the each paper for the evaluation i.e. 100 (4 credits and 150 (6 credits) marks for theory with practical component and theory without the practical component, respectively. The continuous evaluation of theory paper which has the practical component will be of 30 marks and the remaining 70 marks will be devoted to external evaluation. Similarly, the continuous assessment of theory paper which does not have the practical component will be of 50 marks and the remaining 100 marks will be devoted to external evaluation. The distribution of marks for continuous and external assessment is proposed as under:

ContinuousAssessment Weightage			External Assessment Weightage	Total Marks(Tota Credit)
Regular Students		Total	Paperbased External Evaluation(EndtermExamination)	
Mid-Term	Seminar/projectreport/presentation			
20	10	30	70	100(04)

i.e. the 30 /50 marks of continuous assessment for practical/ non-practical subject will have a mid-term test of 20/30 marks and remaining 10/20 marks will be devoted to seminar/ project report/ presentation.

The student has to pass internal and external exam separately in theory as well as practical papers. Minimum passing percentage in Theory papers will be 40 % (internal and external separately) and 50 % in Practical.

1. Paper Pattern for BCA Theory Papers

Section	70 Marks External Paper (4 Credits)	100 Marks External Paper (6 Credits)
Section-A	There will be one question with 10 parts having two parts from each unit with no internal choice. The weight age of each part is 2 marks hence the total weightage of this section is 20 marks (10x2).	There will be one question with 10 parts having two parts from each unit with no internal choice. The weightage of each part is 2 marks hence the total weightage of this section is 20 marks (20x1).
Section-B	There will be five questions with one question from each unit with internal choice (may have subdivisions). The weight of each question of 10 marks hence the total weightage of the section is 50 marks (10x5).	There will be five questions with one question from each unit with internal choice (may have subdivisions). The weight of each question of 16 marks hence the total weightage of the section is 80 marks (16x5).

Teaching Load

Theory 1 Credit = 15 Theory periods of one-hour duration in entire semester (i.e. one hour per week)

Practical 1 Credit = 30 periods of one-hour duration in entire semester (i.e. two hour per week)

I Semester
Introductionto InformationTechnology

Time: 3Hrs.   Max. Marks:70

Min Pass: 28

UNIT-I

Computer Basics: A Simple Modelofa Computer, Characteristics of Computers,Problem-solving Using Computers, Algorithms. Generations and classification of Computers.

Input & Output Devices: Description of Input Units,Other Input Methods, Output Units.

UNIT-II

DataRepresentation:RepresentationofCharactersincomputers,RepresentationofIntegers,Representationof Fractions,Hexadecimal Representation of Numbers, Decimal to Binary Conversion, Error-detectingcodes.

Software Concepts: Types of Software, Software: Qualities & Attributes, Programming Languages: types anddifferences

UNIT-III

Computer Memory: Memory Cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices Used to ConstructMemories, Magnetic Hard Disk, floppy DiskDrives, CompactDisk,ReadOnlyMemory,MagneticTape Drives.

UNIT-IV

Binary Arithmetic: Binary Addition, Binary Subtraction, Signed Numbers, Two's Complement Representation ofNumbers, Addition/Subtraction of Numbers in 2's Complement Notation, Binary Multiplication, Binary Division, Floating Point RepresentationofNumbers,ArithmeticOperationswithNormalizedFloatingPoint Numbers.

UNIT-V

Internet: Network, World Wide Web, Uniform Resource Locator, Web Browsers, IP Address, Domain Name, Internet Service Providers, Introduction to Internet Security, Internet Requirements, Web Search Engine, Net Surfing, Internet Services, Intranet and Extranet, how to connect with internet.

Text /ReferenceBooks

1. "Computer fundamental ",P.K.SinhaBPBPublications.
2. Fundamentals of Computers,V.Rajaraman, 3rdEdition,PHIPublications
3. Essentials of Computer & Network Technology, Nasib S. Gill, Khanna Publications.
4. Fundamentals of Information Technology, Deepak Bharihoke, Excel Books. 2007.
5. InformationTechnologybyReenaDadhichandR.C.Poonia,VardhmanPublications,2009.

Problem Solving through C Programming (BCA1002T)

Time: 3Hrs.   Max. Marks:70

Min Pass: 28

UNIT-I

Algorithm and algorithm development: Definition and properties of algorithm, flow chart symbols, example of simple algorithms. Program design, errors: syntax error and semantic error, debugging, program verification, testing, documentation and maintenance.

UNIT- II

Variable names, data type and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, precedence and order of evaluation, standard input and output statements.

UNIT- III

Control Flow: Statements and blocks, if-else, nested if, switch, looping statement: while, for, do-while, break and continue, go-to and labels.
Arrays : declarations, integer and character array, reading and writing an array, one and two dimensional array, operation son arrays.

UNIT– IV

Functions and Program Structure: Basics of function, function definition and declaration, external
variables,scoperules,headerfiles,staticvariables,registervariables,blockstructure,initialization,re cursion,theCpreprocessor.

UNIT-V

Pointer : Pointers and addresses, pointers and function arguments, address arithmetic..

Structures:, typedef, unions.

Text/Reference Books

1. Computer science Volume I and II, Deendayalu R., Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Fundamentals of computers, RajaramanV., Second Edition, Prentice Hall of India Private Limited,New Delhi.
3. The C Programming Language, Kernighan B.W. and Ritchie D.M., Prentice Hall of India Private Limited, NewDelhi.
4. Howtosolveit by computers. Dromey R.,Prentice Hall ofIndia Private Limited, New Delhi.
5. Programming with C,E.Balaguruswamy, PHI
6. Practical Programming in C
https://ocw.mit.edu/courses/6-087-practical-programming-in-c-january-iap-2010/pages/lecture-notes/

PCSoftwarePackages(BCA1003T)

Time:3Hrs.   Max. Marks:70

Min Pass: 28

UNIT– I

DOS: Introduction, history & versions of DOS, DOS basics- Physical structure of disk, drive name, FAT, file &directorystructureandnamingrules,bootingprocess,DOSsystemfiles,DOS commands: internal &external.

UNIT– II

GUIBasedOS:Concepts,Features,Structure,Desktop,Taskbar,StartMenu,MyComputer,RecycleBin,Accessories- Calculator, Notepad, Paint, Word-pad, Character Map, Explorer, Entertainment, Managing Hardware&Software-InstallationofHardware&Software,UsingScanner,SystemTools,Communication,SharingInformationbetween programs.

UNIT– III

WordProcessing:Features,Creating,SavingandOpeningDocumentsinWord,Interface,Tool bars,Ruler,Menus, Keyboard Shortcut, Editing, Previewing, Printing & Formatting a Document, Advanced Features of MSWord, Find & Replace, Using Thesaurus, Using Auto- Multiple Functions, Mail Merge, Handling Graphics, Tables&Charts,Convertingaworddocumentintovariousformatslike-Text,RichTextformat,Wordperfect,HTMLetc.

UNIT– IV

Worksheet: Worksheet basics, creating worksheet, entering into worksheet, heading information, data, text, dates,alphanumeric values, saving & quitting worksheet, Opening and moving around in an existing worksheet, Toolbarsand Menus, Keyboard shortcuts, Working with single and multiple workbook, working with formulae &cellreferencing, Auto sum, Copying formulae, Absolute & relative addressing, Worksheet with ranges, formatting ofworksheet, Previewing & Printing worksheet, Graphs and charts, Database, Creating and Using macros, Multipleworksheets-concepts,creatingand using.

UNIT– V

IntroductiontonPowerPoint:Creatingslideshowwithanimations,DesigningPresentations. Case Study of web editing tool and DBMS tool such as: Front Page, Ms-Access Creating & using databases inAccess.

Text/ReferenceBooks

1. Introduction to computers byP.K. Sinha&PritiSinha,BPBPublication,1992.
2. Microsoft2000,8 in1 byJoeHabraken, PHI
3. WindowXP Computer Reference, BPBPublication.
4. ITToolsandApplicationsbyA.Mansoor,PragyaPublications,Mathura.
5. DOSQuickReferencebyRajeevMathur,GalgotiaPublications.
6. Ms OfficeXPComputer,BPBPublications.

I Year (II Sem)

Basic Mathematics(BCA2001T)

Time: 3 Hrs.   Max. Marks: 70
                                                                   Min Pass: 28

UNIT - I

Sequences and Series: AP, GP and HP, Arithmetic–Geometric- Harmonic means between two numbers (excluding Arithmetic- Geometric series).
Logarithms: definition, Laws regarding product, quotient, exponent and change of base.

UNIT – II

SETS: Sets, subsets, equal sets, null set, universal set, finite & infinite sets, open & closed sets etc., operations on
Sets, partition of sets, Cartesian product.

UNIT - III

RELATIONS AND FUNCTIONS: relation, properties of relations, equivalence relation, equivalence relation with partition , partial order relation, pigeonhole principle, function, domain and range, onto, into and one-to-one functions, composite functions, inverse functions.

UNIT – IV

DIFFERENTIATION: Derivative, derivatives of sum, differences, product & quotients, derivatives of composite functions, logarithmic differentiation, mean value theorem, expansion of functions,

UNIT - V

Basic concepts of Graph Theory: Vertices, edges, degree, paths, circuits, cycles, complete graphs and trees. Multi-graphs, weighted graphs and directed graphs, Adjacency matrix of a graphs. Connected and disconnected graphs.

Text / Reference Books

1. Elements of Discrete Mathematics, C. L. Liu.: Publisher .Tata Mc-Graw Hill.
2. Addison-Wesley, Thomas, G.B. and R. L. Finney: 9th edition.
3. Mathematics for Engineers, Prasad Mudranalaya, Allahabad, ChandrikaPrasad : 19th edition.
4. Differential Calculus, Shanti Narayan:S. Chand & Co. Publisher *O'Reilly Media, Inc, USA*

DatabaseManagementSystem(BCA2002T)

Time:3Hrs.   Max. Marks:70
                                                                                   Min Pass: 28

Unit–I

Introduction:Purposeofthedatabasesystem,dataabstraction,datamodel,dataindependence,datadefinitionlanguage,datamanipulation language,data baseadministrator, databaseusers, overall structure.

Unit–II

ERModel:entities,mappingconstrains,keys,E-Rdiagram,reducingE-Rdiagramstotables,generation,aggregation,design of an E-Rdatabase scheme.

Unit –III

RelationalModel:Thecatalog,basetablesandviews.RelationalDataObjects-DomainsandRelations:Domains,relations, kindsof relations,relationsand predicates, relational databases. RelationalDataIntegrity–
Candidatekeysandrelatedmatters:Candidatekeys.Primaryandalternatekeys.Foreignkeys, foreign keyrules,nulls. Candidatekeys and nulls,foreignkeyandnulls.

Unit–IV

The SQL Language: Data definition, retrieval and update operations. Table expressions, conditionalexpressions,embedded SQL.
Views: Introduction,whatareviewsfor,datadefinition,datamanipulation,SQLsupport.

Unit–V

Fileandsystemstructure:overallsystemstructure,fileorganisation,logicalandphysicalfileorganization,sequentialandrandom,hierarchical,inverted,   multilist,indexingandhashing,   B-treeindexfiles.

Text/ReferenceBooks

1. DateC.J.,DatabaseSystems,AddisionWesley.
2. Korth,DatabaseSystemsConcepts,McGrawHill.
3. DatabaseManagementSystem,Ramakrishna,Gehkre,McGraw–Hill
6. Databasemanagementsystems,Leonalexis,leonMathews,"Vikashpublication
7. Databasesystem,Rob,coronel,7thedition,CengageLearning.
8. Introduction to Database System and Design Lecture notes by Prof. P.Sreenivasa Kumar, IIT Madras
   https://archive.nptel.ac.in/courses/106/106/106106095/
 9. Database Management Systems Lecture Notes, e-Pathshala, NME-ICT,
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

Data Communication and Computer Networking(BCA2003T)

Time:3Hrs.   Max.Marks:70
                                                       Min Pass: 28

Unit - I

Components of a data communication system, model of a data communication, data transmission concepts, digital and analog transmission, serial/parallel data transmission, signal encoding techniques, modulation and modems.

Unit – II

Guided and unguided transmission media, Transmission impairments, channel capacity, baud rate, bandwidth, multiplexing techniques, synchronous and asynchronous transmission, simplex, half duplex and full duplex transmission.

Unit – III

Circuit switching, Packet switching and Message switching, Connection oriented and Connection less services, Computer Networks Topologies, networks Classification by their Geography

Unit – IV

ISO-OSI model of networking, different layers and their functions, networking and Internetworking, Services gateways, bridges, repeaters, routers, Introduction to ISDN, DSL, Difference between OSI & TCP/IP model.

Unit - V

Introduction to Internet applications like DNS, FTP, SMTP, SNMP, WWW, HTTP, URL, E-mail, Teleconferencing & Electronic Banking, What is IP & IPv4 vs IPv6, What is USB & Difference between USB 2.0 and USB 3.0 .

Reference Books
1. Behrouz A. Forouzan - Data Communication and Networking - 2nd Edition - TMH – 2001.
 2. Stallings W, Data and Computer Communications, Pearson Educations.
 3. Jean Wairand - Communication Networks (A first Course) - Second Edition - WCB/ McGraw Hill - 1998.
4. S. Andrews.Tannenbaum, Computer Networks, Pearson Education.
 5. Computer Networks Lecture notes by Prof. Ajit Pal, IIT Kharagpur
https://archive.nptel.ac.in/courses/106/105/106105080/
6. Computer networks Lecture notes by Prof. Hema A Murthy, IIT Madras
https://archive.nptel.ac.in/courses/106/106/106106091/

BCA II YEAR III SEM

DATA STRUCTURES(BCA3001T)

Time:3Hrs.   Max.Marks:70

Min Pass: 28

Unit I

Introduction: structure and problem solving, algorithmic notation, Data Structure, Algorithms and sub algorithms, introduction to algorithm analysis for time and space

Unit II

Primitive and non primitive data structure concept, representation and manipulation of strings, concept and terminology for non primitive data structure, concept of arrays, stacks, queues. Basic operations on arrays, stacks & queues.

Unit III

Linear data structures and their linked storage representation: pointers and linked allocation, linked linear list, singly linked list, application of linked linear lists.

Unit IV

Non Linear data structure: Trees, types of trees, Graphs and their representations, applications of graph.

Unit V

Sorting and searching: concept of sorting and searching, selection sort, bubble sort, merge sort, binary search

Text / Reference Books

1. An Introduction to Data Structures with Applications, Tremblay &Sorensons, TataMcgraw hills publications.
2. Data structure and algorithms, Aho., Alfred V., Pearson Education.
3. Fundamentals of Data structure in C, Horowitz, Ellis, Galgotia publication.
4. Introduction to Data Structure and algorithms with C++ , Rowe, Glenn W., Prentice , Hall
5. Data structures using C and C++ ,Langsun , Augenstein , Tenenbaum Aaron M, Prentice Hall
6. Data structure and Algorithm using C, R.S. Salaria
7. Data structures Lecture Notes, e-Pathshala, NME-ICT,
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==
8. Introduction to Data structures, Lecture notes, Mumbai University
https://mu.ac.in/wp-content/uploads/2021/05/Data-Structure-Final-.pdf

Digital Electronics(BCA3002T)

Time:3Hrs.   Max.Marks:70
                                                                          Min Pass: 28

Unit-I
Number System and Codes: Decimal, Binary, Hexadecimal, Octal, BCD, Conversions, Complements (1's and 2's), Signed and Unsigned numbers, Addition and Substraction, Multiplication, Gray and Hamming Codes.

Unit-II
Logic Gates and Boolean Algebra: Truth Tables, OR, AND, NOT, XOR, Universal (NOR and NAND) Gates, Boolean Theorems, DeMorgan's Theorems.

Unit-III
Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Minimization Techniques(Karnaugh Map Method: up to 4 variables). Multiplexers(2:1,4:1)) AndDemultiplexers (1:2,4:1), Adder (half and full) and their use as substractor, Encoder (8-line-to-3-line) and Decoder (3-line-to-8-line) , Code Converters(Binary to BCD and vice versa).

Unit-IV
Sequential logic design: Latch, Flip flop, S-R FF , J-K FF, T and D type FFs, Clocked FFs, Registers, Counters (ripple, synchronous and asynchronous, ring, modulus), State Table, State Diagrams and Sequential Machines.

Unit- V
A/D and D/A converters: D/A conversions – Weighted-Register D/A converter, R-2R ladder D/A converter, A/D conversions-Counter type method using D/A, dual slope integrator method, successive approximation method, simultaneous method.
OR
Instruction Execution Cycle, ALU, Addressing Techniques.

Text/Reference Books:
1. Digital Electronics, Principles and Applications, R.L. Tokheim, Tata McGraw-Hill.
2. Digital Principles, R.L. Tokheim, Schaum's Outline Series, Tata McGraw-Hill.
3. Digital Systems, Principles and Applications, R.J. Tocci and N.S. Widner,
Pearson Education Asia.
4. Digital Principles and Applications, A.P. Malvino and D. Leach, Tata McGraw Hill.
5. Digital Design, M.M. Mano, Pearson Education Asia.
6. Digital Fundamentals, T.L. Floyd, Pearson Education Asia.
7. Solved Problems in Digital Electronics, S.P. Bali, Sigma Series, Tata McGraw-Hill.
8. Digital Electronics, W.H. Gothmann, Prentice Hall of India.
9. Modern Digital Electronics, R.P. Jain, Tata McGraw-Hill.
10. Digital systems Lecture notes by Prof. N.J. Rao, IISc Bangalore.
https://archive.nptel.ac.in/courses/106/108/106108099/
11. Computer organization and Architecture Lecture notes by Prof. Jatindra Kumar Deka, IIT Guwahati.
https://archive.nptel.ac.in/courses/106/103/106103068/

Python Programming(BCA3003T)

Time:3Hrs.   Max.Marks:70

Min Pass: 28

Unit I

Introduction to Python: Python variables, Python basic Operators, Understanding python blocks. Python Data Types, Declaring and using Numeric data types: int, float etc.

Unit II

Python Program Flow Control Conditional blocks: if, else and else if, Simple for loops in python, For loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Programming using Python conditional and loop blocks.

Unit III

Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Python Functions, Organizing python codes using functions.

Unit IV

Python File Operations: Reading files, Writing files in python, Understanding read functions, read(), Readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations. Database Programming: Connecting to a database, Creating Tables,INSERT, UPDATE, DELETE and READ operations, Transaction Control,Disconnecting from a database, Exception Handling in Databases.

Unit V

Python packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc. GUI Programming: Tkinter introduction, Tkinter and PythonProgramming, Tk Widgets, Tkinterexamples.Python programmingwith IDE.

Text/Reference Books:

1. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition , Pearson Education, 2016
2. Charles Dierbach, "Introduction to Computer Science using Python", Wiley, 2015
3. Jeeva Jose &P.SojanLal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Publishers, New Delhi, 2016
4. Downey, A. et al., "How to think like a Computer Scientist: Learning with Python", John Wiley, 2015
5. Mark Lutz, "Learning Python", 5th edition, Orelly Publication, 2013, ISBN 978- 1449355739
6. Python Programming Lecture notes, Prof. Ravindra D. Kulkarni, Mumbai university
https://mu.ac.in/wp-content/uploads/2021/08/USIT-301-Python-Programming.pdf

BCA II YEAR IV SEM

OPERATING SYSTEM(BCA4001T)

Time:3Hrs.   Max.Marks:70

                Min Pass: 28

Unit I

Introduction: Definition of an operating system, Mainframe, desktop, single user & multi user OS distributed,real-time and handheld OS.

Unit II

Operating System Structures: System components, operating system services, system calls, systems programs,system structure, virtual machines.

Unit – III

Process Management: criteria, scheduling algorithms, algorithm evaluation.
Process Synchronization: The critical section problem, semaphores, classical problems of synchronization.

Unit IV

Memory Management: Swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Unit V

Virtual Memory: Demand paging, page replacement, allocation of frames, thrashing.

Text / Reference Books
1. Silberschatz G.G., Operating System Concepts, John Wiley & Sons Inc.
2. Modern Operating Systems, Andrew S. Tanenbum, Pearson Edition, 2nd edition, 2004.
3. Operating Systems, Gary Nutt, Pearson Education, 3rd Edition, 2004.
4. Operating Systems, Harvey M. Dietal, Pearson Education, 3rd edition, 2004.
5. Fundamentals of Operating Systems, A.M. (1979).
6. Operating systems Lecture Notes by Prof. P.C.P. Bhatt, IISc Bangalore.
https://archive.nptel.ac.in/courses/106/108/106108101/
7. Operating Systems Lecture Notes, e-Pathshala, NME-ICT,
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

SOFTWARE ENGINEERING(BCA4002T)

Time:3Hrs.   Max.Marks:70
                                                                   Min Pass: 28

UNIT – I

Introduction to Software Engineering: Definitions - Size Factors - Quality and Productivity Factors – Managerial Issues - Planning a software project : Defining the problem - Developing a Solution Strategy - Planning the Development Process - Planning an Organization structure - Other Planning Activities.

UNIT – II

Software Cost Estimation: Software cost factors - Software Cost Estimation Techniques – Staffing level Estimation- Estimating Software Maintenance Costs - The Software Requirements, Specification - Formal Specification Techniques - Languages and Processors for Requirements Specification.

UNIT – III

Software design: Fundamental Design Concepts - Modules and Modularization Criteria – Design Notations - Design Techniques - Detailed Design Considerations - Real-Time and Distributed System Design - Test Plans - Milestones, walkthroughs, and Inspections.

UNIT – IV

Implementation issues: Structured Coding Techniques - Coding Style - Standards and Guidelines – documentation guidelines -Type Checking - Scoping Rules - Concurrency Mechanisms.

UNIT – V

Quality Assurance - Walkthroughs and Inspections - Static Analysis - Symbolic Execution – Unit Testing and Debugging - System Testing - Formal Verification: Enhancing Maintainability during Development – Managerial Aspects of Software Maintenance - Source Code Metrics – Other Maintenance Tools and Techniques.

Text / Reference Books:
1. R.Fairley, Software Engineering Concepts, Tata McGraw-Hill, 1997.
2. R.S. Pressman, Software Engineering, Fourth Ed., McGraw Hill, 1997.
3. Software Engineering, H. SommervillIan , Addition Wesley Pub. Co.
4. Software Engineering: An object Oriented Perspective by Braude, E.J., Willey, 2001.
5. Software Engineering Lecture Notes by Prof. Rajib Mall
https://archive.nptel.ac.in/courses/106/105/106105087/
6. Software Engineering, Lecture Notes, e-Pathshala, NME-ICT,
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

PROGRAMMING WITH JAVA(BCA4003T)

Time:3Hrs.   Max.Marks:70
                                                              Min Pass:28

Unit I

An overview of Java: Object oriented programming, Two paradigms, abstraction, the, OOP principles, Java class libraries, variables, arrays, Data types and casting, Operators, operator precedence, Control statements.

Unit II

Classes & Objects: Class fundamentals, declaring object reference variable, Introducing methods, constructors, the key word, garbage collection, Overloading methods. Inheritance and polymorphism: super class and subclass, protected members, Relationship between super and sub class. Inheritance hierarchy, abstract classes and methods, final methods and classes, nested classes, Type wrappers.

Unit-III

String handling: The string constructor, string length, special string operator character extraction, string comparison, searching string, modifying string, data conversion, changing the case of characters, string buffer.

Unit IV

Multithreaded Programming: The Java thread model, the main thread, creating thread, creating multiple thread, using is alive () and join ().

Unit-V

Exception handling: Exception handling fundamentals
Introduction to Applets: Applet Fundamentals

Recommended Books:
1. Herbert Schildt: JAVA 2 The Complete Reference, TMH, Delhi
2. Deitel: How to Program JAVA, PHI
3. U.K. Chakraborty and D.G. Dastidar: Software and Systems An Introduction, Wheeler Publishing, Delhi.
4. Joseph O'Neil and Herb Schildt: Teach Yourself JAVA, TMH, Delhi
5. Java Programming Lecture notes, MIT open courseware,
https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/pages/lecture-notes/

6. Java Programming Lecture Notes, Mumbai university,
https://archive.mu.ac.in/myweb_test/MCA%20study%20material/M.C.A.%20(Sem%20-%20IV)-%20Java%20Programming.pdf

BusinessCommunication(BCA4005T)

Time: 1.5Hrs.   Max. Marks:50

Min Pass: 20

UNIT-I

Concepts and Fundamentals: Meaning of communication, Importance of communication, Process of communication, Essentials of good communication - The seven Csof communication, Factors responsible for growing importance of communication,Barriersofcommunication.

UNIT–II

Channels of Communication: Verbal and non verbal Communication, oral and written communication formal and informal communication.

UNIT–III

Arts ofListening:Goodlisteningforimproved communications, Artoflistening, Meaning,nature andimportanceoflistening, Principlesof good listening,Barriers inlistening.

UNIT–IV

Writing Letters: Business letters, good news and bad news letters, persuasive letters, Salesletters, Letterstyles/layout.

Report Writing: Meaning & Definition, Types of report (Business report & Academic report), Format of report,,Essentialrequirement of goodreportwriting.

UNIT–V

Modern Techniques of Communication: Internet, Fax, Email, Video Conferencing, sms, bogging, social media etc.

Text/ReferenceBooks

1. CommunicationbyC.S.Rayudu,HimalayaPublishingHouse.
2. CommunicationToday-UnderstandingCreativeSkill byReubenRay,HimalayaPublishingHouse.
3. Successful CommunicationbyMalraTreece,HimalayaPublishingHouse.
4. BusinessCommunicationTodaybyBovee&Thill,McGrawHill.
5. PrinciplesofBusinessCommunicationbyMurphyandHilderbrandth,Tata McGrawHill.
6. EffectiveCommunicationSkiilsbyO.N.Kaul&K.K.Sharma,CreativePublishers
7. Essentialsof BusinessCommunicationbyRajendraPal&J. S.Korlahalli, SultanChand &Sons.
8. BusinessCommunicationbyK.K.Sinha,AlliedPublishersLimited.
9. Business Communication, Lecture Notes,
   https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=ahLCajOqz6/GWFCSpr/XYg==

B.C.A. III Year (V Sem)

E-COMMERCE(BCA5001T) : Elective-1

Time: 3 Hrs.   Max. Marks: 70
                                                        Min Pass: 28

Unit-I

E-commerce: Objectives, advantages and disadvantages, Forces driving E-Commerce, Traditional commerce and Ecommerce, E-Commerce opportunities for industries.

Unit-II

E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Advertising mode, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

Unit-III

Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, Smart Card, Electronic wallet, E-Cash, E-cheque, credit card.

Unit-IV

Digital Marketing, E-Customer Relationship Management, E-Supply Chain Management. E-Commerce: An Indian perspective, Digilocker, attendance.gov.in, mygov.in, Swachh Bharat Mission, E-Hospital, National Scholarship portal, E-Sampark, UID, various modes of Digital payment of govt. of India.

Unit-V

 Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach, Business Ethics, EDI Application in business. Overview of Cyber security .

Text/Reference Books
 1. E - Commerce An Indian Perspective by P.T. Joseph, S.J., PHI
2. Doing Business on the Internet E – Commerce (Electronic Commerce for business) by S. Jaiswal, Galgotia Publications.
 3. E-Commerce by Schneider, Thomson Publication.
 4. E-commerce: Strategy – Technologies and Application by Whitley David, TMH, India.
5. Electronic Commerce by Greenstein, TMH.
 6. Electronic Commerce: A managerial perspective – E.Turban – Prentice Hall of India
 7. Electronic Commerce: Frontiers of Electronic Commerce – Kalarsta&Whinston, Addison-Wesley.
8. Ecommerce Lecture Notes, Mumbai University
https://mu.ac.in/wp-content/uploads/2021/11/E-COMMERCE-English-Version.pdf

Management Information System (BCA5002T): Elective -2

Time: 3 Hrs.   Max. Marks: 70
                                                                            Min Pass: 28

Unit I

Introduction to system and Basic System Concepts, Types of Systems, The Systems Approach, Information System: Definition & Characteristics, Types of information, Role of Information in DecisionMaking, Sub-Systems of an Information system: EDP and MIS management levels, EDP/MIS/DSS.

Unit II

An overview of Management Information System: Definition & Characteristics, Components of MIS, Frame Work for Understanding MIS: Information requirements & Levels of Management, Simon's Model of decision-Making, Structured Vs Un-structured decisions, Formal vs. Informal systems..

Unit III

Developing Information Systems: Analysis & Design of Information Systems: Implementation & Evaluation, Pitfalls in MIS Development.

Unit IV

Functional MIS: A Study of Personnel, Financial and production MIS, Introduction to e-business systems, ecommerce – technologies, applications

Unit V

Decision support systems – support systems for planning, control and decision-making

Text / Reference Books
 1.   J. Kanter, "Management/Information Systems", PHI.
 2. Gordon B. Davis, M. H. Olson, "Management Information Systems – Conceptual foundations, structure and Development", McGraw Hill.
3. James A. O'Brien, "Management Information Systems", Tata McGraw-Hill.
 4. James A. Senn, "Analysis & Design of Information Systems", Second edition, McGraw Hill..
 5. Robert G. Murdick& Joel E. Ross & James R. Claggett, "Information Systems for Modern Management", PHI.
6. MIS Lecture video, Prof. KunalKantiGhosh, IIT Kharagpur
https://archive.nptel.ac.in/courses/110/105/110105148/
7. Management Information Systems, Lecture Notes,
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=ahLCajOqz6/GWFCSpr/XYg==

Web Technology (BCA5003T): Elective-1

Time: 3 Hrs.   Max. Marks: 70
                                                                 Min Pass: 28

Unit I
Introduction to Basics of Internet: Concepts of Internet: Domain, IP Addressing, Resolving Domain Names, Overview of TCP/IP and its Services, WWW.

Unit II
Introduction to HTML, Designing Pages with HTML, Essential Tags, Deprecated Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags (DIV, MARQUEE, NOBR, DFN, HR, LISTING, Comment, IMG), Color and Background of Web Pages, Lists and their Types, Attributes of Image Tag.

Unit III
Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, concept of navigation, Different Section of a Page and Graphics, Footnote , Creating Table, Frame, Form and Style Sheet.

Unit IV
DHTML: Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), The ID Attribute, DHTML Events.

Unit V
Web Designing Tools: Front Page Basics , Web Terminologies, Phases of Planning and Building Web Sites, The FTP, HTTP and WAP, Features, Front Page Views, Adding Pictures, Backgrounds, Links, Relating Front Page to DHTML.

Text / Reference Books
1. HTML Black Book – Steven Holzner – Dreamtech Press.Dreamtech Press.CoriolisGroup,U.S. (Edition .2000)
2. HTML, Java Script, DHTML, PERL, CGI – Evan Bayross – BPB. *Ivan Bayross* (2022)
3. http:www.W3schools.com/html/
4. Dynamic HTML webMagic/ jet douyer-hayden Development group Publisher *Wesley*
5. The DHTML Company only Robert mudrey, PHI.
6. Web Technology, Lecture Notes, e-Pathshala,NME-ICT
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

Programming with PHP (BCA5004T) : Elective-2

Time: 3 Hrs.   Max. Marks: 70
                                                                                        Min Pass: 28

Unit I

Introduction- open source-PHP – history- features-variables- statements- operators-conditional statements-if-switch-nesting conditions-merging forms with conditional statements-loops-while-do-for – loop iteration with break and continue.

Unit II

Array   Anatomy of an Array, Creating index based and Associative array Accessing array, Element   Looping with Index based array, Looping with associative array using each () and foreach(), Some useful Library function.

Unit III

Function   What is a function, Define a function, Call by value and Call by reference, Recursive function, String   Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function

Unit IV

Handling Html Form with Php   Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.
Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function

Unit V

Session and Cookie Introduction to Session Control, Session Functionality What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.

Text / Reference Books
 1. Learning PHP, MySQL, books by ' O' riley Press
 2. Learning PHP, MySQL and JavaScript By Robin Nixon -O"REILLY Publications
 3. Programming PHP ByRasmusLerdorf, Kevin Tatroe, Peter MacIntyrePublisher"O'Reilly Media, Inc.", 2013
 4. Robert Sheldon, Geoff Moes, "Beginning MySQL", Wrox,.Publisher . John Wiley & Sons, 2005
 5. Web Programming with PHP Lecture Notes, Mumbai University
https://mu.ac.in/wp-content/uploads/2021/06/USIT203-Web-programmig.pdf

Cyber Security (BCA5005T) : Elective-1

Time: 3 Hrs.   Max. Marks: 70

                                    Min Pass: 28

Unit I

Information security: overview, information security importance, information security components. Threats to information system- external and internal thread, security threat and vulnerability- overview, malware, type of malware: virus, worms, trojans, rootkits, robots, adware's, spywares, ransom wares, zombies etc., desktop security-

Unit II

Application security- database security, e- mail security, internet security, principles of security- confidentiality, integrity, availability, introduction to cryptography- symmetric key cryptography, asymmetric key cryptography, message authentication, applications of cryptography. Security technology- firewall, type of firewall, firewall benefits, VPN, antivirus software

Unit III

Cyberspace- cloud computing &security, social network sites security, attack prevention- passwords, protection against attacks in social media, securing wireless networks, security threats.

Unit IV

Cybercrime-concept of cybercrime, type of cybercrime, phishing, cyber crime prevention, case study, security threats to e- commerce- electronic payment system, Digital Signature– digital signature process.

Unit V

ISO- international organization for standardization, world intellectual property organization, cyber law- cyber law in India, IT act 2000, intellectual property rights- definition, intellectual property, categories of intellectual property, rights protected under intellectual property, copyright, patent and trademark, design- design law in India

Text / Reference Books
1. Allan Friedman and P. W. Singer, Cyber Security and Cyber war: What Everyone Needs to Know by Published Oxford University
2. Don Franke, Cyber Security Basics: Protect Your Organization by Applying the Fundamentals by Don Franke Publisher CreateSpace Independent Publishing Platform,
3. MayankBhushan, Fundamental of Cyber Security .. Publisher: BPB ...
4. Cyber Security course Cicso systems,
https://www.netacad.com/courses/cybersecurity/introduction-cybersecurity
5. Cyber Security Laws, Odisha State Open University
https://drive.google.com/file/d/1LzNfaUQaYIrth7SV_A9BKj5tnp_n9so0/view
6 Network Securities, Odisha State Open University
https://drive.google.com/file/d/1T3AqVioDDp-E7kQZDzReGt0rPdY5us1e/view

Information Security(BCA5006T): Elective-2

Time:3Hr

Max. Marks: 70

Min Pass: 28

UnitI

Introduction to Information Security : Attacks, Vulnerability, Security Goals, Security Services and mechanisms.

Conventional Cryptographic Techniques : Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography

UnitII

Symmetric and Asymmetric Cryptographic Techniques : DES, AES, RSA algorithms

UnitIII

Authentication and Digital Signatures : Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos

UnitIV

Program Security : Nonmalicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels

UnitV

Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP,S/MIME.

Text/ReferenceBooks
1. Cryptography and Network Security : William Stallings, Pearson Education,411iEdition
2. Cryptography and Network Security :AtulKahate, McGraw Hill, 2" Edition
3. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India
4. Cryptography and Network Security :ForouzanMukhopadhyay, McGraw Hill, 2"d Edition
5. Information Security, Lecture Notes Mumbai University
https://mu.ac.in/wp-content/uploads/2022/05/information-security.pdf

B.C.A. III Year (VI Sem)

Artificial Intelligence (BCA6001T): Elective-1

Time: 3Hrs.   Max. Marks:70

Min Pass: 28

Unit-I

Overview of AI :-Concept of AI, Characteristics of AI applications , Hard vs. Strong Al, Soft vs. Weak AI, Intelligent Agents: Introduction of agents, Structure of Intelligent agent, Properties of Intelligent Agents.

Unit-II

Problem Solving:- Definition of a Problem, Problem formulation, Well-defined problems, Constraint satisfaction problem, Water jug problem.
Problem solving by searching: types of searching, Uninformed: Breadth-First Search, Depth-First Search, Puzzle problem. Informed search: A* Search, Local search: Hill Climbing, Tic-Tac —Toe Problem.

Unit-III

Knowledge Representation And Reasoning:-Definition and importance of Knowledge, Issues in Knowledge Representation, Knowledge Representation Systems, Properties of Knowledge Representation Systems, Types of Knowledge. Knowledge representation techniques: Rule Based, Semantic Nets, Frames, Logic based.

Unit-IV

Machine learning:- Concepts of machine learning, inductive learning, Explanation based learning, Supervised and unsupervised learning(Basic concepts of each)

Unit-V

Natural Language Processing:- Concepts of natural language understanding and natural language generation, Steps in natural language processing (Basic concepts)
Expert System, Architecture of an expert system, Stages of expert systems development.

Text /Reference Books

1.NilsJ.Nilsson,"Principles of Artificial Intelligence(Symbolic Computation/Artificial Intelligence)", reprint edition,.
2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, erdedition,.
3. Daniel Jurafsky, JamesH. Martin Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication,2014.
4. Artificial Intelligence lecture notes by Prof. P. Mitra and Prof. S. Sarkar
https://archive.nptel.ac.in/courses/106/105/106105078/

Data Science (BCA6002T): Elective-2

Time: 3Hrs.   Max. Marks: 70
                                              Min Pass: 28

UNIT-I
Develops all aspects of the machine learning pipeline: data acquisition and cleaning, handling missing data.

UNIT-II
Exploratory data analysis, visualization, feature engineering, modeling, interpretation, presentation in the context of real-world datasets.

UNIT-III
Fundamental considerations for data analysis are emphasized (the bias-variance tradeoff, training, validation, testing).

UNIT-IV
Classical models and techniques for classification and regression are included (linear and logistic regression with regularization, support vector machines, decision trees, random forests, XGBoost).

UNIT-V
Uses the Python data science ecosystem (e.g., sklearn, pandas, matplotlib).

Text/Reference Books:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.
2. JureLeskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets.v2.1, Cambridge University Press. 2014. (free online)
3. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
4. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
5. Trevor Hastie, Robert Tibshirani and Jerome Friedman.Elements of Statistical Learning, Second Edition.ISBN 0387952845. 2009. (free online)
6. Avrim Blum, John Hopcroft and RavindranKannan.Foundations of Data Science for a modern theoretical course in computer science.)
7. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
8. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

Cloud Computing (BCA6003T): Elective-1

Time: 3Hrs.   Max. Marks:70
                                                        Min Pass: 28

Unit-I

Introduction to Cloud Computing:- Overview of Cloud Computing, Evolution of Cloud Computing, Characteristics of Cloud Computing, Types of cloud and its Cloud services,Benefits and challenges of cloud computing, Applications cloud computing, Cloud Storage, Cloud services requirements, cloud and dynamic infrastructure, Cloud adoption.

Unit-II

Cloud Computing Architecture:- Platform as service, Software as a service, Infrastructure as service, Cloud deployment models, Public clouds, Private clouds, Community cloud, Hybrid clouds, Cloud design and implementation using SOA, security, trust and privacy

Unit -III

Cloud Visualization Technology:- Overview of Virtualization techniques, Types of Virtualizations, Implementation Levels of Virtualization Structures, virtualization benefits, server virtualization, hypervisor management software, virtual infrastructure requirements.

Unit -IV

Map Reduce:- Introduction to parallel computing, Map-reduce model, Applications of map reduce, Parallel efficiency of Map-Reduce, Map Reduce infrastructure.

Unit -V

Cloud Security- Introduction to Security, Cloud Security challenges and Risks, Software-as-a-Service Security, Security Monitoring, Security Architecture Design,Data Security, Application Security.Cloud platforms:- Web services, AppEngine, Azures Platform, Aneka

Text /ReferenceBooks

1. Dr. Kumar Saurabh, Cloud Computing.Publisher Wiley.Edition 3RD
2. Raj Kumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing
3. David S. Linthicum, Cloud Computing and SOA Convergence in your enterprise Publishing McGraw Hill Education; First Edition (1 July 2017); McGraw Hill Education (India) Private Limited,
4. Barrie Sosinsky, Cloud Computing Bible Wiley; First Edition (1 January 2011)
5. Saurabh, K. (2011). Cloud Computing — Insights into New -Era Infrastructure, publisher.Wiley India.
6. Cloud Computing Lecture Notes, e-Pathshala,NME-ICT
https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ==

Data Warehousing (BCA6004T): Elective-2

Time: 3Hrs.   Max. Marks: 70
                                                                   Min Pass: 28

Unit – I

Warehouse: What is it, Who Need It, and Why?, Things to Consider, Managing the Data Warehouse, Data Warehouse Design Methodology, Data Marts and Start Schema Design, Fundamentals of ETL Architecture, Partitioning Data, Indexing Data.

Unit – II

Data mining – Introduction, Data mining on what kind of data , Data mining functionalities classification of Data mining systems, Major issues in Data mining Mining Association rules in large databases - Association rule mining, Mining single-Dimensional Boolean association rules from Transactional databases, Mining multi-Dimensional Association rules from relational Databases and Data Warehouses

Unit – III

Classification and Prediction - Introduction classification by decision tree induction, Bayesian Classification. Other classification methods, classification by back propagation, Prediction, classifier accuracy

Unit – IV

Cluster analysis – Introduction types of data in cluster analysis a categorization of major clustering methods portioning methods, hierarchical methods, Density based methods,: DBSCAN, Grid-based method : STRING , Model based clustering method: Statistical Approach, outlier analysis.

Unit – V

Classification & Prediction and Cluster Analysis: Issues regarding classification & prediction, Different Classification Methods, Prediction, Cluster Analysis, Major Clustering Methods, Applications& Trends in Data Mining: Data Mining Applications, currently available tools.

Text /ReferenceBooks
1. J. Han and M. Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Pub.
2. Berson "Dataware housing, Data Mining & DLAP, @004, TMH.
3. W.H. Inmon" Building the Datawarehouse, 3ed, Wiley India.
4. Anahory, "Data Warehousing in Real World", Pearson Education.
5. Adriaans, "Data Mining", Pearson Education.
6. S.K. Pujari, "Data Mining Techniques", University Press, Hyderabad.