SRI DHARMASTHALA MANJUNATHESHWARA COLLEGE, UJIRE-574240

(Autonomous)
(Re-Accredited by NAAC at 'A' Grade with CGPA 3.61 out of 4)

DEPARTMENT OF COMPUTER SCIENCE

Syllabus of
Bachelor's Degree in
COMPUTER SCIENCE

(CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME)

2019-20 ONWARDS

Approved by the BOS meeting held on 18th June 2019
Approved by the Academic Council meeting, held on 10-10-2019

COMPUTER SCIENCE AS A DISCIPLINE

Preamble:

The Department of Computer Science, SDM College, Ujire offers B.Sc Computer Application and B.C.A programs fulfilling the latest requirements of the industry and the changing technological environments. This U.G Programme in Computer Science is perhaps the most popular programme in SDM College, with an average intake of 40+90students per year. The department has adequate facilities to support these teaching activities. It has a well-qualified and experienced faculty team. The Computer Science department makes all efforts in imparting high quality education to its highly motivated students. One of the aims of this department to play its role of producing Computer Engineers ready to satisfy the needs of the Computer and IT world. The Department is also actively involved in various Research activities and Social Responsible Activities.Apart from regular curriculum emphasis is given to hands-on training and design. This course dedicated to provide the students a strong foundation on programming concepts and its application. It also enables the students to solve problems using programmable logic.

Programme Objectives

BCA Degree was designed with the objective of providing the young boys and girls the computer knowledge and skills to undertake rewarding professions

The curriculum's main objectives are to impart students with an understanding of the basics of computer science, to develop proficiency in the practice of computing, and to prepare them for continued professional development

It also aims at bringing computer education to the rural students, besides exposing students in information communication technology

Programme Outcomes

PO1: Serve as the Programmers or the Software Engineers with the sound knowledge of practical and theoretical concepts for developing software.

PO2: Serve as the Computer Engineers with enhanced knowledge of computers and its building blocks.

PO3: Work as the Hardware Designers/Engineers with the knowledge of Networking Concepts.

PO4: Work as the System Engineers, System integrators the System Administrators with thorough knowledge of DBMS.

PO5: Work as the Support Engineers and the Technical Writers

PO6: Work as Consultant and Management officers for system management.

PO7: Work as IT Sales and Marketing person.

PO8: Serve as the IT Officers in Banks and cooperative societies.

PO9: Work as DTP Operator in small-scale firms and business organisations

PO10: Serve as the Web Designers with latest web development technologies Improve their computer literacy, their basic understanding of operative systems and a working knowledge of software commonly used in academic and professional environments.

PO11: Develop criteria to organize and present different type of works in academic and professional environments.

PO12: Organize information efficiently in the forms of outlines, charts, etc. by using appropriate software.

PO13: Present ideas effectively and efficiently in Academic and Professional Presentations

PO14: Use the Systems Analysis Design paradigm to critically analyze a problem.

PO15: Solve the problems (programming networking database and Web design) in the Information Technology environment and function effectively in teams to accomplish a common goal and demonstrate professional behavior.

PO16: Develop IT-oriented security issues and protocols.

Programme Specific Outcomes

PSO1: Serve as the Programmers or the Software Engineers with the sound knowledge of practical and theoretical concepts for developing software.

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PSO3: Work as the Hardware Designers/Engineers with the knowledge of Networking Concepts.

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PSO6:   Work as Consultant and Management officers for system management.

PSO7:   Work as IT Sales and Marketing person.

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PSO14: Use the Systems Analysis Design paradigm to critically analyze a problem.

PSO15: Solve the problems (programming networking database and Web design) in the Information Technology environment and function effectively in teams to accomplish a common goal and demonstrate professional behavior.

PSO16: Develop IT-oriented security issues and protocols.

SDM COLLEGE, UJIRE (AUTONOMOUS)
Bachelor of Computer Applications (BCA) Degree Programme Pattern and Scheme of Examinations

I SEMESTER BCA

Group	Course Code	Course	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	IA	Exam	Total	Credits
I	BCA101	Fundamentals of Information Technology	4	-	3	20	80	100	2
	BCA102	Fundamentals of C	4	-	3	20	80	100	2
	BCA103	Mathematics	4	-	3	20	80	100	2
	BCA104	Office Automation Lab	-	6	3	20	80	100	2
	BCA105	Fundamentals of C Lab	-	6	3	20	80	100	2
II	BCA106	**Elective-I: Discipline Supportive** E1 : Internet Basics E2: Cloud Computing	2	-	2	10	40	50	1
III	BCA107	Language-I	4	-	3	20	80	100	2
	BCA108	Language-II	4	-	3	20	80	100	2
	BCA109	Elective Foundation	2	-	2	10	40	50	1
IV	BCA110	CC & EC	2	-	2	50	-	50	1
		Total	**26**	**12**	**27**	**210**	**640**	**850**	**17**

BCA-106: ElectiveCourses: Course Detailed are attached in APPENDIX I(page no. 46)

II SEMESTER BCA

Group	Course Code	Course	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA151	Computer Organization and Architecture	4	-	3	20	80	100	2
	BCA152	Advanced C and C++	4	-	3	20	80	100	2
	BCA153	Database Management System	4	-	3	20	80	100	2
	BCA154	C++ Lab	-	6	3	20	80	100	2
	BCA155	DBMS Lab	-	6	3	20	80	100	2
II	BCA156	**Elective-II : Expanded Scope** E1 : Internet of Things E2: Big Data Analytics E3: Artificial Intelligence	2	-	2	10	40	50	1
III	BCA157	Language-I	4	-	3	20	80	100	2
	BCA158	Language-II	4	-	3	20	80	100	2
	BCA159	Elective Foundation	2	-	2	10	40	50	1
IV	BCA160	CC & EC	2	-	2	50	-	50	1
		Total	**26**	**12**	**27**	**210**	**640**	**850**	**17**

BCA206: Elective Courses: Course Detailed are attached in APPENDIX I(page no. 45)

III SEMESTER BCA

Group	Course Code	Course	Theory Hours/Week	Practical Hours/Week	Duration of exams (Hrs)	IA	Exam	Total	Credits
I	BCA201	Operating Systems	4	-	3	20	80	100	2
	BCA202	Data Structures using C++	4	-	3	20	80	100	2
	BCA203	Visual Basic .NET Programming	4	-	3	20	80	100	2
	BCA204	Data Structuresusing C++ lab	-	6	3	20	80	100	2
	BCA205	VB.Net Lab	-	6	3	20	80	100	2
II	BCA206	**Elective-III : Other Discipline /Domains** E1 : Fundamentals of ICT E2: E-Commerce	2	-	2	10	40	50	1
III	BCA207	Language-I	4	-	3	20	80	100	2
	BCA208	Language-II	4	-	3	20	80	100	2
	BCA209	Elective Foundation	2	-	2	10	40	50	1
IV	BCA210	CC & EC	2	-	2	50	-	50	1
		Total	**26**	**12**	**27**	**210**	**640**	**850**	**17**

BCA206: Elective   Courses: Course Detailed are attached in APPENDIX I(page no. 45)

IV SEMESTER BCA

Group	Course Code	Course	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	IA	Exam	Total	Credits
I	BCA251	Computer Graphics and Animation	4	-	3	20	80	100	2
	BCA252	Java Programming	4	-	3	20	80	100	2
	BCA253	E1: Data Mining E2: CONA E3: Business Statistics & Mathematics	4	-	3	20	80	100	2
	BCA254	Computer Graphics and Animation Lab	-	6	3	20	80	100	2
	BCA255	Java Lab	-	6	3	20	80	100	2
II	BCA256	**Elective-IV Skill Development** E1 : Hardware & Maintenance E2 : Desktop Publishing E3: Excel Programming with VBA	2	-	2	10	40	50	1
III	BCA257	Language-I	4	-	3	20	80	100	2
	BCA258	Language-II	4	-	3	20	80	100	2
	BCA259	Elective Foundation	2	-	2	10	40	50	1
IV	BCA260	CC & EC	2	-	2	50	-	50	1
		Total	**26**	**12**	**27**	**210**	**640**	**850**	**17**

BCA 256: Elective Courses: Course Detailed are attached in APPENDIX I(page no. 45)

V SEMESTER BCA

Group	Course Code	Course Particulars	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA301	Software Engineering	4	-	3	20	80	100	2
	BCA302	Computer & Communication Networks	4	-	3	20	80	100	2
	BCA303	Distributed Computing	4	-	3	20	80	100	2
	BCA304	Web Technology	4	-	3	20	80	100	2
	BCA305	Python Programming	4	-	3	20	80	100	2
	BCA306	**Elective-II:** E1:Accounting& Financial Management E2: Android Application Development E3: SciLab	4	-	3	20	80	100	2
	BCA307	Web Applications Lab	-	3	3	20	80	100	2
	BCA308	Python Programming Lab	-	3	3	20	80	100	2
	BCA309	Elective lab	-	3	3	20	80	100	2
		Total	**24**	**9**	**27**	**180**	**720**	**900**	**18**

VI. SEMESTER BCA

Group	Course Code	Course Particulars	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA351	E-Commerce	4	-	3	20	80	100	2
	BCA 352	Network Security & Management	4	-	3	20	80	100	2
	BCA353	Software Testing	4	-	3	20	80	100	2
	BCA 354	**Elective II:** E1: Programming for Analytics E2: Business Statistics with R E3: Multivariate Data Analysis E4: LAMP Technology	4	-	3	20	80	100	2
	BCA 355	Project Work	-	20	3	100	Reports - 300 Presentation and Viva - 100 Total: 400	500	10
		Total	**24**	**18**	**27**	**180**	**720**	**900**	**18**

Total Marks: 5200

Grand Total Credit for three year BCA Degree Programme   : 104

I SEMESTER BCA

Group	Course Code	Course	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA101	Fundamentals of Information Technology	4	-	3	20	80	100	2
	BCA102	Fundamentals of C	4	-	3	20	80	100	2
	BCA103	Mathematics	4	-	3	20	80	100	2
	BCA104	Office Automation Lab	-	6	3	20	80	100	2
	BCA105	Fundamentals of C Lab	-	6	3	20	80	100	2
II	BCA106	**Elective-I: Discipline Supportive** E1 : Internet Basics E2: Cloud Computing	2	-	2	10	40	50	1
III	BCA107	Language-I	4	-	3	20	80	100	2
	BCA108	Language-II	4	-	3	20	80	100	2
	BCA109	Elective Foundation	2	-	2	10	40	50	1
IV	BCA110	CC & EC	2	-	2	50	-	50	1
		Total	**26**	**12**	**27**	**210**	**640**	**850**	**17**

Group I	**BCA101 :**	48 hours
Course-1	**FUNDAMENTALS OF INFORMATION**	
Theory/Week: 4 Hrs	**TECHNOLOGY**	I.A: 20
Credits: 2		Exam: 80

Learning Objective: To impart the knowledge about the evolution of computers, classification, various peripherals of computers , types of softwares etc.

Learning Outcome : Able to identify various devices and their working principles.

UNIT I	12 Hrs.

Computer Basics: Introduction, Characteristics computers, Evolution computers, Generation of computers, Classification of computers, the computer system, Application of computers.

Computer Architecture: Introduction, Central processing unit- ALU, Registers, Control unit, system bus, main memory unit, cache memory, communication between various units of a computer system. **Components inside a computer system** – System case, Power supply, Mother board, BIOS, Ports and Interfaces, Expansion card, Ribbon cable, Memory chips, Processors.

UNIT II	12 Hrs

Computer memory and storage : Introduction, memory representation, memory hierarchy, Random access memory, Types of RAM, Read-only memory, Types of ROM,RAM, ROM and CPU interaction.

Secondary Storage: Types of secondary storage device - Magnetic tape, magnetic disk, Floppy disk, Hard disk, Advantages and disadvantages of magnetic disk, Optical disk, Types-CD,DVD, Blu ray disk, Advantages and disadvantages of optical disk, Magneto-optical disk, Memory stick, , Universal serial bus, Mass storage devices.

UNIT III   **12 Hrs**

Input devices: Introduction, Types of input devices, Keyboard, Mouse, Introduction to Track ball, Joystick light pen, Touch screen and track pad. Speech recognition, digital camera, webcam, flat bed scanner, Optical character recognition, Optical MarkRecognition, Magnetic ink character recognition, Bar code reader. **Output devices**: Types of output, Classification of output devices, Printers- Dot matrix, drum printer, Ink jet, Laser, Hydra, Plotter, Monitor-CRT, Displaying graphics on CRT, Colour display on CRT,LCD, Differences between LCD and CRT, Other types of monitors, Voice response ,Projector, Electronic white board.

UNIT IV   **12 Hrs**

Computer programming languages: Introduction, Developing a program, Program development cycle, Types of programming languages, generation of programming languages, Features of a good programming language. **Computer software:** Introduction, software definition, relationship between software and hardware, software categories, Installing and uninstalling software, software piracy, software terminologies. Word processing software, **Spreadsheet** software: Excel environment, Copying cells using Fill handle, dragging cells, Formulas and functions, Inserting Charts, sorting. **Presentation software**: Introduction, , PowerPoint environment, creating a new presentation, working with different views, using masters, adding animation, adding transition, running slides.

Microsoft Access : Access environment, Database objects.

Text Book:

1. ITL Education Solution Limited, **Introduction to Information Technology**, Pearson-Second Edition.

Reference Books:

1. Peter Norton, **Introduction to Computers**, 7th edition, Tata McGraw Hill Publication, 2011

2. Anita Goel, **Computer Fundamentals**, Pearson Education, 2011.

Group I	**BCA 102:**	48 hours
Course-2	**FUNDAMENTALS OF C**	
Theory/Week 4 Hrs		IA: 20,
Credit :2		Exam: 80

Learning Objective: To develop skills in solving problems, to obtain knowledge about the structure of the programming language C and to develop the program writing and logical thinking skill.

Learning Outcome : To apply programming knowledge to create solutions to challenging problems, including specifying, designing, implementing and validating solutions for new problems

UNIT I	12 Hrs

Problem Solving techniques : Introduction , Problem solving procedure, **Algorithm:** Steps involved   in algorithm development , Algorithms for simple problems : To find largest of three numbers, factorial of number , check for prime number ,check for palindrome , Count no.of odd , even and zeros in list of integers. **Flowcharts:** Definition , advantages, Symbols used in flow charts. Flowcharts for simple problems mentioned in algorithms. Psuedocode. **Introduction to C**: Overview of C Program, Importance of C Program, Basic structure of a C-program, Execution of C Program.   **Constants, Variables & Data types:** Character set, C token, Keywords & identifiers, Constants, Variables, data types, Declaration of variables, assigning values to variables, defining symbolic constants.

UNIT II	12 Hrs

Operators and Expression: Arithmetic, Relational, logical, assignment, increment & decrement, conditional, bit wise & special operators, evaluation of expressions, Precedence of arithmetic operators, type conversions in expressions, operator precedence & Associativity, built in mathematical functions. **Managing Input and Output operations**: Reading & writing a character, formatted input and output. **Decision Making and Branching:** Decision making with if statement, simple if statement, the if else statement, nesting of if … else statements, the else if ladder, the switch statement, the ?: operator, the go to statement. **Decision making and looping:** The while statement, the do statement, for statement, exit, break, jumps in loops.

Arrays: Declaration, initialization & access of one dimensional &two dimensional arrays. Programs using one and two dimensional arrays- sorting and searching arrays. **Handling of Strings:** Declaring & initializing string variables, reading strings from terminal, writing strings to screen, Arithmetic operations on characters, String Handling functions,table of strings. **User defined functions:** Need for user defined functions, Declaring, defining and calling C functions return values & their types, Categories of functions: With/without arguments, with/without return values. Nesting of functions

UNIT IV   12 Hrs

Recursion: Definition, example programs. **Storage classes:** The scope, visibility & lifetime of variables. **Structures and union:** Structure definition, giving values to members, structure initialization, comparison of structure variables, arrays of structures, arrays within structures, Structure and functions, structures within structures. Unions. **Pointers:** Understanding pointers, accessing the address of a variable, declaring & initializing pointers, accessing a variable through its pointer, pointer expression, pointer increments & scale factor, pointers & arrays, Pointer and strings, passing pointer variables as function arguments. File Management-Create in Read/Write and Append mode, copying file. **The Pre-processor:** Macro substitution, file inclusion,

Text Books:

1. E. Balagurusamy, Programming in ANSI C, 7th Edition, Tata McGraw Hill.
2. Introduction to Information Technology ITL education solution Ltd, Second Edition

Reference Books:

1. K.R. Venugopal and Sudeep R Prasad, Programming with C, 4th Edition, Tata McGraw-Hill Education.
2. Yashavant P. Kanetkar, Let Us C, 10th Edition, Tata McGraw Hill, 2010.

Group-1	**BCA 103 :**	**48 hours**
Cousre-3	**MATHEMATICS**	
Theory/Week:4 Hrs		I.A: 20
Credits:2		Exam: 80

UNIT-I — 12 Hrs.

Sets, Relations and functions- Recapitulation of sets, subsets, cardinality of a set, Cartesian product of two sets. **Mathematic Logic**: Proposition and truth values, Connectives, their truth tables, Inverse, converse, contra-positive of an implication.

Tautology and Contradiction- logical equivalence, Standard theorems, examples from Switching circuits, truth table and problems.

UNIT-II — 12 Hrs.

Matrices and Determinants- Definition of matrices, types of matrices, addition, Scalar multiplication and multiplication of matrices-Problems.

Determinants- Definition of determinants, second, third order, solving a system of equations using cramer's rule.

Trigonometry- Radian measures, conversion of degree into radians and radians into degrees.

Trigonometric functions-Definition of trigonometric functions, problems.

UNIT-III — 12 Hrs.

Analytical geometry-Points, distance formula with proof, problems.Statements of the following formulae. Section formula, Mid point formulaArea of a triangle, centroid of the triangle. Problems.

Locus- definition of the problem involving circle,perpendicular bisector and area of triangle.

Circles-definition , typ4es of circles, $x^2+y^2=r2,(x-h)^2+(y-k)^2=r^2$. General form of a circle (without proof),problems to find centre, radius. Touching circles, equation and the length of tangent(without proof), problems.

UNIT-IV — 12 Hrs.

Elementary Graph theory-Recapitulation of polyhedral and networks

Definition of a graph and related terms like vertices, degree of a vertex, odd vertex, even vertex, edges, loops, multiple edges, (u, v) walk, trivial walk, closed walk, trail, path, closed path, cycle, even and odd cycle, cut vertex and bridges.

Types of graphs-finite graph ,infinite graph, multiple graph, simple graph, (pq) graph, null graph, complete graph, bipartite graph, regular graph, self complementary graph, sub graph, super graph, connected graph, Eulerian graph, and trees.

Theorems-In a graph with p vertices and q edges , degree of vertices is always the twice the number of edges. Vi=2q.

Text Book:

1. T Prakash Prabhu and others, A Classic text book of mathematics for II Puc, S D M excellent publication.

2. T Prakash Prabhu and others, A Classic text book of mathematics for I Puc, S D M excellent publication.

Practical-I	BCA 104 : OFFICE AUTOMATION LAB	48 Hours
Practical/Week: 6 Hrs **Credits: 2**	Exercises in MS-Office package	**I.A: 20** **Exam: 80**

Practical-II	BCA 105: C Programming Lab	48 Hrs
Practical/Week: 6 Hrs **Credits: 2**	Exercises in C language	**I.A: 20** **Exam: 80**

Group-II	**ELECTIVE - I : SEMESTER SUPPORTIVE**	**24 Hours**
Course-1	**COURSE**	
Theory :2hrs/week	**BCA 106-E1:INTERNET BASICS & HTML**	**IA : 10**
Credits : 1		**Exam : 40**

Learning Objectives

- To provides knowledge about basic concepts of internet and its applications and about various 18nternet tools available. Also to learn HTML instructions to develop simple web pages

- **Learning Outcome :**

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

- Understand features of Internet and email

- Develop Simple web pages using HTML & Style Sheets

UNIT - I   12 Hrs

The Internet : Introduction, Evolution, basic internet terms, Getting connect to internet, Internet applications, Data over the internet **Internet tools:** Web browser, Web browser features, Internet Explorer environment, Electronic mail, Email address structure, checking email,sending email, email attachment, How email works, advantages and disadvantages of email,

Search Engines: Searching an internet, refining the search, Instant messaging, Features of messangers.

UNIT - II   12 Hrs

Creating Web page using HTML tags: Concepts of HTML, Head & Body Sections,Building HTML documents using various text formatting tags: <H1>...<H6>, <B>,<U>,<I>, <FONT>,

<SUP><SUB><P> with align,
<BLOCKQUOTE>

<BODY> with attributes bgcolor, background,text, <HR> with size,color, Lists: Ordered, unordered and definition lists, <IMG><A>

Creating tables :<TABLE>,<CAPTION>,<TH><TR><TD> with various attributes

Creating frames <FRAMESET>,<FRAME> tags with attributes-

Creating FORMS with elements <Input> types textbox, radio, checkbox, list box, combo box,text area, submit, button , reset.

Cascading Stylesheets : Inline, embedded and external stylesheets with examples by applying font, background and box properties.

Text Books :   1. ITL Education Solution Limited, **Introduction to Information Technology**, PearsonEducation, 2012

2. Steven Holzner, HTML Black book, dreamtech publisher, 2010

Group II   **24 Hours**

Course-2

ELECTIVE - I : SUPPORTIVE COURSE
BCA 106-E2: CLOUD COMPUTING

Theory/Week 2 Hrs   **IA :10**

Credit :1   **Exam :40**

Learning Objectives:

Introducing Cloud Computing,   Provides knowledge about basic concepts of cloud types, services and Deployment models. To provide knowledge about cloud data storage.

Learning Outcome :

Analyze the Cloud computing setup with its vulnerabilities and applications &Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

UNIT I	12 Hours

Introduction to Cloud Computing:, History and Evolution of Cloud Computing, Roots of Cloud Computing , Layers and Types of Clouds ,Cloud   , Desired Features of a cloud , Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks.

Migrating into a Cloud: Introduction, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Migration Risks and Mitigation

The Enterprise Cloud Computing Paradigm: Relevant Deployment Models for Enterprise Cloud Computing, Adoption and Consumption Strategies, Transition challenges ,The Cloud supply chain.

Virtualization : Introduction to   Virtualization   , Virtualization technology Overview ,, Virtual machine provisioning and Manageability , ,Virtual machine migration services

UNIT II	12 Hours

Secure distributed data storage in cloud computing : cloud storage: From LANs to WAN, Moving From LANs to WANs, Existing Commercial Cloud Services, Vulnerabilities in Current Cloud Services, Technologies for data security in cloud computing, Database Outsourcing and Query Integrity Assurance, Data Integrity in Untrustworthy Storage, Web-Application-Based Security Multimedia Data Security Storage.

SLA Management in Cloud : Introduction , traditional methods of SLO management ,types of SLA , Life cycle of SLA, SLA Management in Cloud , Automated Policy Based Management

Performance Prediction for HPC in Cloud : Grid and Cloud , Grid and Cloud integration. ,HPC in cloud

Cloud Best Practices : Business and technical benefits of cloud Computing , Understanding Amazon Web Services Cloud, Cloud Best Practices,

Data Security in Cloud Computing: Introduction , data Security risk , Cloud computing and identity digital identity and data Security .

Text Book:

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, John Wiley and Sons Publications, 2016

Reference Books:

1. Kailash Jayaswal, Jaganath Kallakurchi ,Donald&Dr.DevenShah,Cloud Computing, Black Book, dream tech publisher.
2. Toby Velte, AnthonyVenlte, Cloud Computing, A Practical Approach, Mcgraw-hill, 2009

II SEMESTER BCA

Group	Course Code	Course	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA151	Computer Organization and Architecture	4	-	3	20	80	100	2
	BCA152	Advanced C and C++	4	-	3	20	80	100	2
	BCA153	Database Management System	4	-	3	20	80	100	2
	BCA154	C++ Lab	-	6	3	20	80	100	2
	BCA155	DBMS Lab	-	6	3	20	80	100	2
II	BCA156	**Elective-II : Expanded Scope** E1 : Internet of Things E2: Big Data Analytics E3: Artificial Intelligence	2	-	2	10	40	50	1
III	BCA157	Language-I	4	-	3	20	80	100	2
	BCA158	Language-II	4	-	3	20	80	100	2
	BCA159	Elective Foundation	2	-	2	10	40	50	1
IV	BCA160	CC & EC	2	-	2	50	-	50	1
		Total	**26**	**12**	**27**	**210**	**640**	**850**	**17**

BCA 151:
COMPUTER ORGANIZATION AND ARCHITECTURE

Learning Objectives: The objective of this subject is to introduce the number system and Boolean algebra. The course will also enable the student to understand the design components of a digital subsystem that required realizing various components such as Register, Counter .and etc.

Learning Outcome : At the end of this course students will learn various nuber systems , Boolean algebra concepts ,various design Components of Computer System like logical gates m registers, counters.

UNIT-I   12 Hours

Digital Computer System: Introduction to Number system, Decimal number, Binary number, Octal and Hexadecimal numbers, Number base conversion, Complements, Binary codes, Binary logic, Integrated Circuits, Binary arithmetic's, Addition and Subtraction in the 1's and 2's complement system, Addition and Subtraction in the 9's and 10's complement system. Boolean algebra :Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Venn diagram.

UNIT-II   12 Hours

Digital logic gate : Boolean functions, Canonical and Standard forms, other logic operations, Digital logic gates, Universal gate. Simplification of Boolean function: The map method, Two and three variable maps, Four - variable maps, Don't Care conditions, Product of sum Simplification, NAND implementation, NORimplementation. Implementation of EX-OR, EX-NOR using NAND and NOR gate.

UNIT-III   12 Hours

Adder and Subtractor : Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary parallel adder, BCD adder. Combinational Logic: Some common combinational circuits used in digital systems. Code converter, Exclusive-OR and Equivalence functions. Magnitude comparator, Decoders, Encoders, Multiplexers, Demultiplexers.

Sequential Logic : Introduction, Flip flops, RS-FF, D-FF. T-FF, and JK-FF. Triggering of flip-flops, Master slave Flip flop, state table, and State diagram. State equations, Flip Flop excitation tables, Sequential circuits design. Registers, Counters: Synchronous Counters design using RS, JK, D, & T flip flops. Ripple countersIntroduction, Registers, Shift registers, Timing sequences, Bidirection shift register.

Text Books :

1. M.Morris Mano, **Digital Logic and Computer Design**, PHI.

Reference books:

1. Thomas L Floyd, **Digital Fundamentals**, 10th Edition, Pearson, 2011.
2. Thomas .C. Bartee, **Digital Computer Fundamentals**, 6th edition, TMH

Group-I	48 hours

Course -5

Theory/Week:4	**BCA 152: ADVANCED C AND C++**	I.A: 20
Hrs		**Exam: 80**

Credits:2

Learning Objects :

To understand concept of Object Oriented Programming and Create Software applications using OOPs Concept.

Learning Outcome :

On Completion of Course students will understand how to apply the major object-oriented concepts to implement object oriented programs in C++.

UNIT I	12 Hrs

Pointers: Understanding pointers, accessing the address of a variable, declaring & initializing pointers, accessing a variable through its pointer, pointer expression, pointer increments & scale factor, pointers &arrays, malloc(), calloc(), free() and realloc()

The Preprocessor: Macro substitution, file inclusion, compiler control directives, command line arguments & illustrative programs. **File Management in C:** Introduction, defining and opening a file, closing a file, I/O operations on files, error handling during I/O operations.

UNIT II	12 Hrs

Principles of Object Oriented programming: basic Concepts, benefits, application.

Beginning with C++: Program features, comments, cin, cout, return statement, Structure of a C++ program.Dynamic initialization of variables, reference variables, the operators::, ::*, .*, delete, endl, new, setw

Classes and objects: structures, specifying a class, creating objects, accessing class members, defining member functions, making outside functions inline, nesting of member functions, private member functions, arrays with in a class, memory allocation for objects,   static   data members, static member functions, arrays of objects, objects as function arguments, friends functions, returning objects, const member functions, pointers to members.

<div align="center">**UNIT III**</div> <div align="right">**12 Hrs**</div>

Constructors and destructors: Parameterized constructors, multiple constructors, constructors with default arguments, dynamic initialization of objects, copy constructor, dynamic constructors, constructing 2 dimensional arrays, destructors.

Operator overloading: defining, overloading unary and binary operators, overloading binary operators using friend functions, manipulation of strings using operator overloading, type conversions – basic to class, class to basic, one class to another class.

<div align="center">**UNIT IV**</div> <div align="right">**12 Hrs**</div>

Inheritance: Defining a derived class, single inheritance, protected members, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, virtual base classes, abstract classes, constructors on derived classes, nesting of classes.

Pointers, virtual functions, polymorphisms: Pointers to objects, this pointer, pointers to derived classes, virtual functions, pure virtual functions.

Text Book:

E Balagurusamy, **Object Oriented Programming with C++**, 5th Edition, Tata McGraw hill Publication.

Reference Books:

1. D Ravichandran, **Programming with C++**, Third Edition, McGraw hill 2011
2. Robert Lafore, **Oriented Programming in C++**, Galgotia Publications Pvt. Ltd, 2006..

Group I		48 hours
Course -6	**BCA 153: DATABASE CONCEPTS AND**	
Theory/Week 4 Hrs	**ORACLE**	IA: 20
Credit :2		Exam: 80

Learning Objectives:

To provide knowledge about RDBMS Concepts ,SQL Concepts and PL/SQL Programming. To provide knowledge about database normalisation and to learn theory behind data models and query Languages.

Learning Outcome:

- The student will be able: To describe data models and schemas in DBMS
- To understand the features of database management systems and Relational database.
- To Demonstrate an understanding of the relational data model and use SQL.
- To understand the functional dependencies and use SQL solutions to a broad range of query and data update problems.

UNIT I   12 Hrs

Database and Database Users: DBMSDefinition , Characteristics of the Database Approach, Advantages of Using a DBMS, Database Users, Database Administrators .

Database System concepts and architecture: Data Models, Schemas, and Instances, Three-schema architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Classification of Database Management Systems.

Data Modeling Using the Entity-Relationship Model : High-Level Conceptual Data Models for Database Design, An example database application, Entity Types, Entity Sets, Attributes and Keys, Relationships, Relationship Types, sets, roles, and Structural Constraints, Weak Entity Types, ER Diagrams. Design issues.

UNIT II   12 Hrs

Relational Data Model, Relational Constraints: Relational Model Concepts, Relational model Constraints and Relational Database Schemas, Update Operations, transactions and Dealing with Constraint Violations.

Relational Algebra: Unary relational algebra Operations : SELECT and PROJECT, Relational Algebra operations from Set theory, Binary relational operations - JOIN and DIVISION, Additional Relational Operations. **Basics of Functional dependencies and Normalization for Relational databases:** Functional dependencies, Normal Forms based on primary keys, General definitions of second and third normal forms, Boyce-Codd Normal form. **Disk Storage, basic file structures and Hashing**: Secondary storage devices, Buffering of Blocks, Placing File Records on Disk, Operations on Files, Files of Unordered Records (Heap Files), Files of Ordered Records (Sorted Files), Hashing Techniques.

<div align="center">

UNIT III   **12 Hrs**

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SQL-The Relational Database Standard : Data manipulation in DBMS, Data types, SQL commands: Create Table, Inserting data, SELECT, DELETE, UPDATE, ALTER TABLE, DROP TABLE, RENAME, DESCRIBE. (Explain with syntax and examples) Computations on table data, DUAL, SYSDATE, UNION,INTERSET MINUS CLAUSE ORACLE functions, DATA constraints on table, USER_CONSTRAINT TABLE, defining and dropping Integrity constraint in ALTER TABLE, Default value concepts, GROUP BY, HAVING, ORDER BY, Sub queries, Joins. SQL transaction commands COMMIT, ROLLBACK and SAVEPOINT.

<div align="center">

UNIT IV   **12 Hrs**

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Introduction to PL/SQL: PL/SQL structure , CURSORS: Definition, Types of cursors , cursor attributes ,Parameterized cursors, Exception Handling: Need for exception handling , named Exception handlers, RAISE_APPLICATION ERROR PROCEDURE, Stored Procedures and functions, Package Database triggers.

Text Books:

1. RamezElmasri and ShamkanthB.Navate, Fundamentals of Database Systems, 7th Edition, Pearson Education

 2. Ivan Bayross, SQL/PL/SQL- the Programming language of Oracle, 2nd Revised edition (or 4th revised Ed), BPB Publications

Reference Books:

1. Abraham Silberschatz, Henry Korth and S. Sudarshan, Database Systems Concepts, 3rd edition, McGraw Hill International Editions.

2. C J Date, Introduction to Database systems, Addison-Wesley.

Practical-III	BCA 154 :C++ LAB	48 Hours
Practical/Week: 6 Hrs **Credits: 2**	Exercises on C++ programming	**I.A: 20** **Exam: 80**

Practical-IV	BCA 155: DBMS Lab	48 Hrs
Practical/Week: 6 Hrs **Credits: 2**	Exercises on DBMS problems	**I.A: 20** **Exam: 80**

ELECTIVE -II: EXPANDED COURSE
BCA 156-E1: INTERNET OF THINGS

Theory/Week 2 Hrs   **IA :10**

Credit :1   **Exam :40**

Learning Objectives:

To learn Basic concepts behind IoT and to study design principles for Connected devices, IoT communication protocols, internet based connectivity, Sensor technologies and Sensor data Communication protocols

Learning Outcome :

Students will be fully aware of Technology behind IoT , Design Principles for Connected devices ,IoT communication protocols and internet based communication.

UNIT I   12 Hrs

Internet of Things Overview : IoT Definition , IoT vision ,smart and hyper connected devices , IoT conceptual framework, IoT Architectural view, Technology behind IoT , Components of IoT system, ,Development tools,APIs and Device interfacing components , Platform and integration tools ,Sources of IoT , M2M communication , M2M architecture, Software and Development tools, IoT examples.

Design Principles for Connected Devices : Introduction , Modified OSI model for IoT /M2M systems,ITU-T reference model ,Communication technologies. **Design Principles for Web** : Web Communication protocols for connected devices ,Message Communication protocols ,Communication Gateway protocols-SOAP ,REST,HTTP RESTFUL and WEBSOCKETS

UNIT II   12 Hrs

Internet Connectivity -Introduction , Internet connectivity , Internet based communication , IP addressing in IoT.Data Acquiring and storage , Organising the data Transactions on stored data.

Internet Connectivity -Introduction , Internet connectivity , Internet based communication , IP addressing in IoT.Data Acquiring and storage , Organising the data Transactions on stored data

TEXT BOOK :

Raj Kamal*, Internet of Things:*Architecture and Design Principles, Mc Graw Hill Education.

Reference Books:

1. Rob Barton, Gonzalo Salgueiro, David Hanes, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press,2017.

2. ArsheepBahga , Vijay Madisetti, Internet of Things: A Hands-On Approach,2014

Group II	ELECTIVE -II: EXPANDED COURSE	24 Hours
Courss-4	BCA 156-E2: BIG DATA	
Theory/Week 2 Hrs		IA :10
Credit :1		Exam :40

Learning Objectives:

- To provides an overview of approaches facilitating data analytics on huge datasets.
- To Introduce various Technologies for Handling Big Data

Learning Outcome :

At the end of the course the students will be understand:

- Basic Concept of Big Data
- Hoop Ecosystem , Role of Hbase and MapReduce Frame work

UNIT I   12 Hrs

Getting an Overview of Big Data :- What is Big Data. History of Daya management – Evolution of Big Data. Structuring of Big Data. Types of data, Structures Data, Unstructured Data,Challenges Associated with unstructured Data ,Semi -Structured Data, Elements of Big Data,Big Data Analytics, Advantages of Big Data Analytics, Carreers in Big Data

Exploring the use of Big Data in Business Context:-Use of Big Data in social networking,Use of Big Data in preventing Fradulent activities, Use of Big Data in Detecting Fradulent activities in Insurance Sector, Use of Big Data in Retail Industry

Introducing Technologies for Handling Big Data :-   Distributed and Parallel Computing for Big Data,

How data models and computing models are different? Introducing Hadoop, Cloud Computing and Big Data, In- Memory Computing Technology for Big Data.

Understanding Hadoop Ecosystem:- Hadoop Ecosystem, Hadoop DistributedFile System, MapReduce, Hadoop YARN, Introducing Hbase, Combining Hbase and HDFS,Hive ,Pig and Pig Latin, Sqoop, ZooKeeper,Flume ,Oozie.

UNIT II   12 Hrs

Understanding   MapReduce,   Fundamentals   and   Hbase:-   The   MapReduce Framework,Techniques to Optimize MapReduce Jobs,Uses of MapReduce,Role of Hbase in Big Data Processing.

Undrestanding Big Data Technology Foundations:-Exploring the Big Data Stack ,Physical Redundant Networks, Virtualization and Big Data, Virtualization Approaches.

Storing Data in Databases and Data Warehouses:- RDBMS and Big Data, Non –relational Database, Polygolt Persistence, Integrating Big Data with Traditional Data Warehouses,Big Data Analysis and data Warehouse, Changing Deployment Models in Big Data Era

Text Book:

1. DT Editorial Services , Big Data Black Book Black Book , Dreamtech Press Publications,2016

Reference Books:

1. **Furht**, Borko, **Villanustre**, Flavio, Big Data Technologies and Applications, Springer publication,2016.

2. Vijayalakshmi Radha andShankarmani**, Big Data Analytics** Wiley Publication,2016.

Group II	ELECTIVE -II: EXPANDED COURSE	24 Hours
Course-5	BCA 156-E3: ARTIFICIAL INTELLIGENCE	
Theory/Week 2 Hrs		IA :10
Credit :1		Exam :40

Learning Objectives:

- To provide a strong foundation of fundamental concepts in *Artificial Intelligence*
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning

Learning Outcome :

At the end of the course the students will

- Aware various searching techniques, constraint satisfaction problem and example problems
- Able to apply these techniques in applications which involve perception, reasoning and learning
- knowledge of real world Knowledge representation.

UNIT I	12 Hrs

Introduction : What is AI ? Early work in AI, Importance of AI, AI and its related fields ,AI techniques

Problems , Problem space and search : Defining the problem as state space search ,Control strategies, **heuristic search Heuristic search techniques:** Generate and test, Hill climbing : Simple hill climbing, steepest-Ascent hill climbing , best- first search ,climbing agendas , problem reduction ,constraint specification .**Knowledge Concepts:**   Introduction ,definition and importance of knowledge , some knowledge based systems, Knowledge representation , organization ,manipulation , acquisition

General concepts in Knowledge acquisition : Introduction learning , types of learning , general learning model , performance measures

UNIT II	12 Hrs

Pattern recognition : Introduction ,the recognition and classification process , Learning classification , Patterns , Recognizing and understanding speech . **Expert System architecture :**   Introduction , characteristics features of expert system , background history , applications , importance of expert system , rule based architectures . **LISP and other AI Programming language** : Introduction to LISP ; syntax and numeric functions , Basis List manipulation function ,

functions , predicates and conditionals , input , output and local variables , iteration and recursion , , property lists and array , miscellaneous topic , PROLOG and other AI programming languages .

Text Book:

1. Elaine Rich and K.Knight , Artificial Intelligence , TMH 3nd edition, 2009
2. RAJENDRA AKERKAR , Introduction to AI and Expert Systems , PHI publications , 2014

Reference Books:

1. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson education
2. Saroj Kaushik, Artificial Intelligence, Cengage Learning India, 2011

III SEMESTER BCA

Group	Course Code	Course	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA201	Operating Systems	4	-	3	20	80	100	2
	BCA202	Data Structures using C++	4	-	3	20	80	100	2
	BCA203	Visual Basic .NET Programming	4	-	3	20	80	100	2
	BCA204	Data Structures using C++ lab	-	6	3	20	80	100	2
	BCA205	VB.Net Lab	-	6	3	20	80	100	2
II	BCA206	Elective-I :**Other Discipline /Domains** E1 : Fundamentals of ICT E2: E-Commerce	2	-	2	10	40	50	1
III	BCA207	Language-I	4	-	3	20	80	100	2
	BCA208	Language-II	4	-	3	20	80	100	2
	BCA209	Elective Foundation	2	-	2	10	40	50	1
IV	BCA210	CC & EC	2	-	2	50	-	50	1
		Total	26	12	27	210	640	850	17

Group-I	BCA 201:	48 hours

Group-I

Course-7

Theory/Week: 4 Hrs

Credits: 2

BCA 201:
OPERATING SYSTEM & LINUX

48 hours

I.A: 20

Exam: 80

Learning Objectives:

- To make students understand the purpose, role, structure, functions, application of operating systems , Understand services provided by operating systems and to study Linux file system and commands.

Learning Outcome :

- At the end of the course students will able to Analyze the structure of OS and basic architectural components involved in design Analyze the various resource management techniques conceptualize the components involved in designing a contemporary OS

- Learn Linux Operating system basics

UNIT - I   12 Hrs

Introduction: Operating System, simple batch systems, Multi-programmed batched system, time sharing systems, real-time systems, system components, Operating system services

Process: Process concept, process scheduling, Cooperating processes, threads

CPU Scheduling: Basic concepts, scheduling criteria, scheduling algorithms.

UNIT – II   12 Hrs

Process synchronization: Critical section problem, synchronization (algorithms excluded), semaphores, classical problems of synchronization

Dead Locks: Deadlock characterization, methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, recovery from Deadlock.

UNIT - III   12 Hrs

Memory Management: Logical verses physical address space, swapping, contiguous allocation, paging, segmentation.

Virtual Memory: Demand paging, page replacement , page replacement algorithms, allocation of frames

File System: File Concept, access methods, directory structure, file system structure, allocation methods

Introduction to Unix: History, System- V release, Kernel and shell, Features of Unix

Commands and Utilities & Unix File System: Locating commands, Internal and external commands, arguments, options and filenames, flexibility of usage, Help. General Utilities: cal, date, who, tty, passwd, echo, bc, script, spell, uname, wc, zip, tar, sort,Unix File System:- Categories, names, parent-child relationship, absolute path name, changing, creating, removing directories, listing files & directories, relative path names. Handling files-displaying, creating, copying, deleting, renaming files, printing, ,comparing files.

Shell Programming: Shell, pattern matching and quotations. Redirection, pipes. Vi editor-modes, working with Text. File ownership-permissions, octal notation. Shell scripts, command line arguments. Operators and conditional execution-if-else, case, Looping- while, for. Expr computations

UNIX/LINUX Practical demonstrations

Text Books:

1. Abraham Silberschartz and Peter Galvin, **Operating System Concepts**, 5th edition, TMH

2. Sumitabha Das, **Unix – Concepts and Applications**, Tata McGraw Hill

Reference books:

1. Milan Milenchivic, **Operating systems**, McGraw Hill

2. Bryan Kernighan and Rob Pike ,**Unix Programming Environment**, PHI

3. Colin Ritchie,**Operating systems incorporating Unix and Windows**,3rd edition, BPB Publication

Group-I	**BCA 202:**	**48 hours**

Group-I
Course-8

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BCA 202:
DATA STRUCTURES USING C++

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48 hours

Theory/Week 4 Hrs   **I.A: 20**

Credits :2   **Exam: 80**

Learning Objectives:

* To choose the appropriate data structure and algorithm design method for a specified application.

* To learn the systematic way of solving problems, various methods of organizing large amounts of data.

Learning Outcome

* To describe the usage of various data structures

* To choose the appropriate data structure to solve a programming problem

* To demonstrate various methods of organizing large amounts of data.

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UNIT I   **12 Hrs**

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Introduction: Algorithmic notation.

Linear Data Structures and sequential storage representation: Concept and terminology for non-primitive data structures, storage structures for arrays, structures and arrays of structures, Stacks definitions and concepts, operation on stacks, applications of stacks, Recursion, infix to postfix, evaluating postfix expressions, queues, priority queues.

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UNIT - II   **12 Hrs**

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Linear Data Structures and Linked storage representation: Pointers and linked allocation, linked linear lists, operations on linear lists using singly linked storage structures, Circularly linked linear lists, Doubly linked linear lists.

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UNIT - III   **12 Hrs**

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Nonlinear Data Structures: Trees –definition and concepts, operations on binary trees, linked storage representation of binary trees, tree creation and traversal.

Graphs- Matrix representation of graphs, breadth first search, depth first search.

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UNIT - IV   **12 Hrs**

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Sorting and searching:- Sorting, selection sort, bubble sort, merge, quick, searching, sequential and binary searching.

Text Books :

1. An Introduction to Data Structures with Applications 2nd Edition– J.P.Trembly and Sorenson McGraw Hill 2001

Reference Books:

1. Data Structures using C & C++ - YedidyahLangsun, Moshe J Augenstein, Tenenbaum – PHI Ltd
2. Algorithms + Data Structures= Programs – Niklaus Wirth PHI 1976
3. Data Structures and Algorithms- Aho, A.V.Hopcroft and Ullman - Addison Wesley 1980
4. Fundamentals of Data Structures – Horowitze and Sahni- Gogotia Bookstore
5. Data Structures and Program Design – Robert, L Krunse, PHI
6. Data and File Structures- Mary Lunis, PHI
7. Theory and problems of Data Structures- Seymour Lipshutz, McGraw Hill

Group I

Course -9

Theory/Week: 4 Hrs

Credits: 2

48 hours

BCA203:

VISUAL BASIC .NET PROGRAMMING

I A: 20

Exam: 80

Learning Objective: To learn programming with graphical interface using object oriented concept .

Learning Outcome : To develop skill in VB .NET framework, tools, programming and connectivity with databases.

UNIT-I	12 Hrs.

Essential Visual Basic .NET,Working with Visual Basic .NET, New features, .NET framework and common language runtime, system name space File extensions in VB.Net, The visual Basic integrated Development Environment : start page,menusystem,tool bars, New project dialog box, graphical designers, code designers, Intellisense, object browser, Toolbox, Solution explorer, property window, dynamic help window, component tray,server explorer, output window, task list,command window

The Visual Basic Language: Visual basic statements- General syntax with keywords public, protected, friend, private, static, readonly. Option and import statements, Declaring constants and variables(with public, protected, friend, private, static, readonly.) Datatypes, datatype conversion, checking data types, declaring arrays and dynamic arrays,Redim and Preserve keywords, Handling Strings, string handling functions, conversion between strings to numbers and vice versa, characters and character codes, Operators,Operator precedence, commenting, Decision making: if...else, select case statements, Selections - switch and choose, Loop - Do, For, For Each...Next, While statements; With statement, Math methods, dates time properties, formatting date and time,End statement.

UNIT II	12 Hrs

Sub procedures and Functions: scope, exceptions, creating Sub procedures and Functions with private and public only, passing variable no. of arguments, using optional procedure arguments, preserving variable's values between Procedure calls with static variables, scope-block, procedure, module, name space, **Exception handling**: unstructured exception

handling, using Resume Next and Resume Line, On ErrorGoTo 0, getting an exception's number and description, raising an exception intentionally, structured exception handling, exception filtering in the Catch Block, Multiple Catch statements, using Finally,throwing an Exception, throwing a Custom Exception.**Windows Forms**: About Windows Forms,form designer, **Form properties**- Text,control box, maximize and minimize box, formborderstyle, cotrolling tab order,setting initial positions,back color, background image, enabled, visible,forecolor, height, icon, isMDIchild, Ismdicontainer, Location, Mdichildren, Mdiparent, name,width, windowstate, **Windows forms methods** – Activate,close, focus, hide, layoutmdi, refresh, show, showdialog.**Events:**Activated,Click,Closed, Closing, Doubleclick, Forcolorchanged, Gotfocus,Move, Sizechanged, Textchanged. **MDI** :Creating MDI applications, creating MDI child windows in code,Arranging MDI child windows. MsgBox function, InputBoxfunction,creating dialog box, Displaying reading from dialog box,creating accept and cancel button. Handling Mouse events and handling keyboard events. Sending keystrokes to other programs.

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UNIT III   12 Hrs

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Text Boxes, Rich Text Boxes, Labels and Link Labels: Use of Text boxes, Rich Text Boxes, Labels and Link Labels, Creating Multiline, Word-wrap Text Boxes, Accessing Text, Adding Scroll Bars, Aligning text, Making aText Box read-only, selecting and replacing Text in a Text Box, copying or getting selected text to or from the clipboard, creating a password control, controlling input in a Text Box, TextChanged event creating textbox in code.

 Accessing Text in a Rich Text Box, creating Bold, Italic, Underline and Strikeout Text, Indenting Text in Rich Text Boxes,,Adding Bullets to Rich Text Boxes, Text color in RTF boxes, saving and loading RTF files from and to Rich Text Boxes, Aligning Text in RTB, creating RTB in Code.

Using Labels instead of Text Boxes, Formatting, aligning Text in labels, Label Events, using Labels to give access keys to Controls without Captions, Use of Link Labels,Creating link labels, linking to another form.Use of Buttons, Checkboxes, Radio Buttons, Panels and Group boxes .

Buttons : Setting forecolor and back color, font,taborder,picture, click event **Checkboxes:** Getting and setting checkbox state, creating three state checkboxes.**Radiobutton:**Getting and setting radiobuttonstate, togglebuttons. Adding controls to panel and groupbox in code.Use of List Boxes, Checked List Boxes, Combo Boxes and Picture Boxes.Listbox: Adding item,referring item by index,selected index changed, click,removingitem,sorting, counting items, SelectedItem, SelectedIndex, multicolumn, multiselect listboxes, clearing a list box,**CheckListBox**:Determining the items checked, checking or unchecking items through code, handling item check events in checked list box.Types of comboboxes: simple, dropdown, dropdown list. **Picturebox:** setting or getting the image,adjusting box size, creating image maps. **Use of** Scroll Bars, Track Bars, Pickers, Tool Tips and Timers Properties of scrollbars and trackbar: Largechange, Smallchange, Maximum, Minimum, Value. Scroll event , Orientation, Tickstyle,Tickfrequency.**DateTimePicker:** Maxdate, Mindate, customformat, text, value. Setting datetime picker custom formats. Creating tooltips, Timer properties, methods and events.

Use of Image Lists, Tree and List Views, Toolbars, Status and Progress Bars.Creating and using imagelist with other controls, Handling treeview events, creating in code,Creating, selecting, handling listviews, Creating toolbar with dropdown button,menuitems, imagebutton, combobox. Creating, adding panels, displaying text in status bar, creating progress bar.

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UNIT IV   **12 Hrs**
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Menus : Creating menus, submenus, adding checkmark to items, manu access key, menu shortcuts, merging MDI menus, creating context menu, creating Open File, Savefile, Font, Color dialog boxes,Printing, creating printpreview, pagesetupdialoboxes. **Data Access with ADO.NET:**databases, Basic SQL commands, Working with ADO.NET,Overview of ADO.NET objects, Accessing with server explorer,populating a dataset, **Binding Controls to Databases:**Various ways to bind the data,simple binding, complex binding, binding data to control, Navigating data sets, Adding and deleting from a dataset, canceling a dataset edit, updating the underlying datastore, Performing data validation in controls.**Handling Database in Code**: creating a table, data columns, datarows, in code, accessing individual data items. Writing datasets to XML and reading datasets from XML.

Text Book:

1. Steven Holzner, **Visual Basic.NET Programming Black Book**, Dreamtech Press

Reference Books:

1.Bradley, Millspaugh Julia Case, Anita, **Programming in Visual Basic. NET**, Tata McGraw Hill.

2.Dr Garima Khadelwal, **Programming with Visual Basic. NET**, Prakhar Publishers Distributors

Group-I Practical-V	BCA 204 :Data Structure Using C++ Lab	48 Hours
Practical/Week: 6 Hrs **Credits: 2**	Exercises on OS and DS programming	**I.A: 20** **Exam: 80**

Practical-VI	BCA 205: VB .NET Lab	48 Hrs
Practical/Week: 6 Hrs **Credits: 2**	Exercises on VB .NET problems	**I.A: 20** **Exam: 80**

Group II		24 Hours
Cpourse-6	**ELECTIVE -III: OTHER DOMAIN**	
Theory/Week 2 Hrs	**/DISCIPLINE**	IA :10
Credit :1		Exam :40

BCA 206-E1: FUNDAMENTALS OF ICT

Learning Objectives:

- To make the students understand and learn the basics of computer for its effective use in day to day life.

Learning Outcomes:

- Be able to apply knowledge of computing analyze a problem, and identify and define the computing requirements appropriate to its solution

- Be able to design, implement, and evaluate a computer based system, process, component, or program to meet desired needs

UNIT I	12 Hours

Computer Basics: Introduction, Characteristics computers, Evolution computers, Generation of computers, Classification of computers, the computer system, Application of computers.

Computer Architecture: Introduction, Central processing unit- ALU, Registers, Control unit, system bus, main memory unit, cache memory, communication between various units of a computer system

Number system : Conversion between binary, decimal , octal and hexadecimal integers.

Computer software: Introduction, software definition, relationship between software and hardware, software categories, Installing and uninstalling software, software piracy, software terminologies.

UNIT II	12 Hours

Computer programming languages: Introduction, Developing a program, Program developmentcycle, Types of programming languages, generation of programming languages, Features of a good programming language. Word processing software, **Presentation software**: Introduction, ,Powerpoint environment, creating a new presentation, working with different views, using masters, adding animation,adding transition, running slides.**Microsoft Access**:Access environment, Database objects.

Spreadsheetsoftware: Excel environment,Copying cells using Fill handle, dragging cells, Formulas and functions, Inserting Charts, sorting.**The Internet :**Introduction, Evolution, basic internet

terms,Internet applications, Data over the internet. **Internet tools:** Web browser, Web browser features, Internet Explorer environment, Electronic mail, Email address structure, checking email,sending email, email attachment, How email works, advantages and disadvantages of email, searching

Text Book:

ITL Education Solution Limited, **Introduction to Information Technology**, Pearson- Second Edition, 2008.

Reference Books:

1. Peter Norton, **Introduction to Computers**, 7th edition, Tata McGraw Hill Publication, 2011
2. Anita Goel, **Computer Fundamentals**, Pearson Education, 2011.

Group II	**Elective -III: Other domain /Discipline**	**24 Hours**
Course-7		
Theory/Week 2 Hrs	**BCA 206-E2:**	**IA :10**
Credit :1	**E-COMMERCE**	**Exam :40**

Learning Objectives:

Introduce concepts and principles E-commerce, modern technologies used to simplify business and banking processes through e- commerce, provision of E-commerce services.

Learning Outcomes

 At the end of the course the students will be fully aware of:

* the principles and practice of Electronic Commerce
* the components, functions and roles of the Electronic Commerce environment
* E-Commerce payment systems.

UNIT I   12 Hours

Overview of Electronic Commerce: Main Activities, definition, Goals, Components, Advantages and disadvantages, Technical architecture, E-Com applications, E-Com and Electronic business

Electronic Commerce: Network infrastructure: Evolution of the Internet, Business use, LAN, MAN, WANs.

OSI Model: Introduction to OSI Model, Seven Layers, Overview of TCP/IP reference model.

UNIT II   12 Hours

Electronic Data Interchange: Introduction to EDI, Definition, Applications, EDI Model.

Electronic Payment System: Introduction to payment system, Types, The traditional payment system, Modern Payment system. **Payment Security:** Different techniques.

Electronic Security: Introduction, Classification of intruders, Attacking methods, Security practices, Cryptography.   **Cryptology:** Encryption and decryption, Secret key and Public key encryption

Text Book:

1. C. S. V. Murthy, **E-commerce: Concepts, Models, Strategies**, Himalaya Publishing House, 2012

Reference Books:

1. Bharat Bhaskar, **Electronic Commerce: Framework, Technologies and Applications**, 4thedition, McGraw Hill company, 2014
2. Ravi Kalakota, Andrew B. Whinston, **Frontiers of Electronic Commerce**, Addison-Wesley Publications, 2000

IV SEMESTER BCA

Group	Course Code	Course	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA251	Computer Graphics and Animation	4	-	3	20	80	100	2
	BCA252	Java Programming	4	-	3	20	80	100	2
	BCA253	E1: Data Mining E2: CONA E3: Business Statistics & Mathematics	4	-	3	20	80	100	2
	BCA254	Computer Graphics and Animation Lab	-	6	3	20	80	100	2
	BCA255	Java Lab	-	6	3	20	80	100	2
II	BCA256	Elective-I **Skill Development** E1 :Hardware & Maintenance E2 : Desktop Publishing E3: Excel	2	-	2	10	40	50	1

		Program ming with VBA							
III	BCA257	Language-I	4	-	3	20	80	100	2
	BCA258	Language-II	4	-	3	20	80	100	2
	BCA259	Elective Foundation	2	-	2	10	40	50	1
IV	BCA260	CC & EC	2	-	2	50	-	50	1
		Total	26	12	27	210	640	850	17

Group I		
Course-10	**BCA401:**	**48 hours**
Theory/Week: 4 Hrs	**COMPUTER GRAPHICS AND ANIMATION**	**I.A: 20**
Credits: 2		**Exam: 80**

Learning Objective: To learn about various technologies in computer graphics, animation and virtual reality system.

Learning Outcome: Students are able to draw primitive graphical shapes and perform transformation techniques programatically. They are also learning about various new technologies developed and their applications.

UNIT I   12 Hrs.

Introduction to Computer Graphics and Display Systems: Introduction, Image and Objects, Image Representation, Basic Graphics Pipeline, Raster and Vector-Based Graphics, Applications of Computer Graphics, Display Devices, Flat Panel Display Displays, , 3D Display Technology, Coordinate System Overview-Carticsian Coordinate system, Introduction to Graphics Libraries in C. Line Drawing Algorithms- DDA, Bresenham's, Loading theFrame Buffer, Line Function, Circle Generating Algorithms, Ellipse Generating Algorithms, Filled-Areaprimitives..

UNIT II   12 Hrs

Attributes of Output Primitives: Line attributes, Curve Attributes, Color and Grayscale levels, area fillattributes, Character attributes. Two Dimensional Geometric Transformations- Basic Transformations,Matrix Representations and Homogeneous Coordinates, Composite Transformations, Other Transformations,Transformations between Coordinate Systems, Affine Transformations. Two-Dimensional Viewing: TheViewing Pipeline, Viewing Coordinate Reference Frame, Window-to-Viewport Coordinate Transformation,Two-Dimensional Viewing Functions, Clipping operations, Point clipping, Line clipping- Cohen-SutherlandLine clipping, Polygon clipping-Sutherland-Hodgeman Polygon clipping.

Computer Animation: Introduction, Key Frame Animation, Construction of Animation Sequence, Motion Control Methods, Procedural Animation , Key Frame animation Vs Procedural Animation, Introduction to Morphing.   **Introduction to Virtual Reality**: Introduction, Classical Components and Design of VR System, Important Factors in Virtual Reality System, Types of Virtual Reality Systems, Advantages of Virtual Reality.

UNIT IV 12 Hrs

Graphic Display Interface, Sound Display Interface, Examples of Input Devices, Haptic Feedback, Graphical Rendering Pipeline, Applications of Virtual Reality: **Object Modeling and Computer Architecture for Virtual Reality**: Introduction, Modeling Techniques in Virtual Reality, Model Management, PC Graphic Architecture and Accelerators

Text Book:

1. Rajesh K. Maurya, Computer Graphics with Virtual Reality Systems., 2nd Edition, Wiley publication, 2014.

2. Donald Hearn, M. Pauline Baker**, Computer Graphics - C version**, 2nd Edition, LPE Pearson, 1996.

Reference Books:

1. Tay Vaughan, Multimedia: Making It Work, 8th Edition, Tata McGraw Hill, 2011.

2. Steven Harrington, Computer Graphics: A Programming Approach, McGraw Hill Education,1987.

3. James D. Foley, Fundamentals of interactive computer graphics, Addison Wesley Longman Publishing Co, 1982.

Group I

Course-11

Theory : 4 hrs/week

Credits : 2

48 Hours

BCA 251: JAVA PROGRAMMING

IA : 20

Exam :80

Learning Objectives

1. To understand pure object-oriented programming paradigm

2. To familiarize with the fundamentals of Java features

3. To introduce console and GUI based applications using Java

4. To know the basic approaches to the design of software applications.

Learning Outcome : At the end of the course the students will be able to

1. Know the structure and model of the Java programming language

2. Use the Java programming language for various programming technologies

3. Develop software using the Java programming language

4. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems.

UNIT - I   **12 Hrs**

Language Basics - The creation of Java, How Java Impacted Internet?, Java's Magic – Bytecode, The Java Buzzwords, A First Simple Program, Using blocks of Code, Lexical Issues, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, The Scope and Lifetime of Variables, Type Conversion and Casting, Arrays, Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Java's Selection Statements, Iteration Statements, Jump Statements.   **Class & Objects** - Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The 'this' keyword, Overloading Methods, Using Objects as Parameters, Returning Objects, Recursion, Understanding 'static', Introducing 'final ', Introducing Nested and Inner Classes, Using Command-Line Arguments, Varargs : Variable-Length Arguments

Inheritance - Inheritance Basics, Using 'super', Creating Multilevel hierarchy, Method Overriding, Using Abstract Classes, Using final with Inheritance. **Packages & Interfaces** - Packages, Importing Packages, Interfaces. **Exception Handling** - Exception Handling Fundamentals – Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, throw, throws, finally, Java's built-in Exceptions

Multithreaded Programming - The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization

12 Hrs

UNIT - III

Networking – Networking Basics, InetAddress, Inet4Address and Indet6Address, TCP/IP Sockets, URL, URL Connection. **Event Handling** - Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, The KeyEvent Class, Sources of Events, Event Listener Interface, Using Delegation Event Model, Adapter Classes, Inner Classes. **Swings**- The origins of Swing, Two key Swing features, Components and Containers, The Swing Packages, A simple Swing Application, Event Handling, Jlabel and ImageIcon; JTextField, The Swing Buttons, JTabbedPane, JScrollPane, JList, JComboBox, Trees, JTable.

12 Hrs

UNIT - IV

Swing Menus – Menu Basics, An Overview of JMenuBar, JMenu and JMenuItem, Create a Main Menu, Create a Toolbar. **JDBC Objects -** The Concept of JDBC, JDBC Driver Types, JDBC Packages, A Brief Overview of the JDBC process, Database Connection, Associating the JDBC/ODBC Bridge with the Database, Statement Objects, ResultSet, Transaction Processing; Metadata, Data types, Exceptions.

JDBC & Embedded SQL – Tables, Inserting Data into Tables, Selecting Data from Table, Updating Tables, Deleting Data from a Table.

Text Books

1. Herbert Schildt,Java The Complete Reference, 10th Edition, McGrawHill, 2018

2. Jim Keogh, The Complete Reference J2EEMcGrawHill, 2014,

Reference Books

1. Introduction to Java Programming: Brief Version, Pearson, 2014,

2. R. Nageswara Rao,Core Java: An Integrated Approach, dreamTech, 2016,

Group I

Course-12

Theory : 4 hrs/week

Credits : 2

48 Hours

BCA 252-E1: DATA MINING

IA   : 20

Exam :80

Learning Objectives :

- To introduce students to the basic concepts and techniques of Data Mining

- To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems

- Develop and apply critical thinking, problem-solving, and decision-making skills

Learning Outcome :

- On Successful completion of subject students will learn

- Various Data Mining concepts , Association rules and Clustering techniques , Web mining Concepts & Decision tress.

- Ability to select and implement data mining techniques suitable for the applications under consideration

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| UNIT - I | 12 Hrs |

Introduction: Data Mining: Introduction, What is data mining, Data Mining Definitions, KDD Vs Data Mining, DBMS Vs Data Mining, Other related areas, DM techniques, Other Mining Problems, Issues and Challenges in DM, DM application areas, DM applications.**Data Warehouse**: Introduction, What is Data Warehouse, Definition, Multidimensional Data Model, OLAP operations, Warehouse Schema, Data Warehouse Architecture, Warehouse Server,Meta Data, Data Warehouse backend process.

| UNIT - II | 12 Hrs |

Association Rules: Introduction, Association Rule, Methods to discover association rules, a priori algorithm, partition algorithm,pincer-search algorithm(only concept p-84),   **Decision Trees** :Introduction, Decision Tree, Tree Construction Principle, Best Split, Splitting Indices (only definitions of Entropy,   (p-169,170),Decision Tree Construction Algorithms, CART, ID3. **Rough Set Theory** :Introduction, Definition(up to -Rough Set p-210,211), Rough Sets and Fuzzy Sets (concept, definition of rough set member function-p226), **Other Techniques** :Introduction, Neural Network, Learning in NN, Unsupervised Learning, Genetic Algorithm, Support Vector Machines (concept p-250,251)

Clustering Techniques: Introduction, Clustering Paradigms, Partitioning, Algorithms, k-Medoid Algorithms (PAM concept, Partitioning concepts. p-123), CLARA, Hierarchical Clustering, DBSCAN (concept Only, No definitions. p- 129), Categorical Clustering Algorithms, STIRR (concept p-143-excluding example)

Web Mining: Introduction, Web Mining, Web Content Mining, Web Structure Mining (exclude example), Web Usage Mining, Text Mining, Unstructured Text, Episode Rule Discovery for Texts. **Temporal And Spatial Advanced Data Mining: Introduction**, Temporal Data Mining, Temporal Association Rules, Sequence Mining, The GSP Algorithm, Episode Discovery, Spatial Mining.

Text Book:

1. Arun K. Pujari, Data Mining Techniques, 2nd Edition, Universities Press India, 2010

2. Han, Jiawei and Kamber, Michelin,*Data Mining: Concepts and Techniques*. Morgan Kaufman Publishers, 2012.

Reference Books :

1.   M Ramakrishna Murthy, Introduction to Data Mining and Soft Computing Techniques, Laxmi Publications Pvt Ltd, 2017.

2. Paul Teetor, R Cookbook: Proven Recipes for Data Analysis, Statistics, and Graphics, O'reilly Cookbooks, 2011

Group I	BCA 253-E2: COMPUTER ORIENTED	48 hours
Course-13	NEUMARICAL ANALYSIS	
Theory/Week:4 Hrs		I.A: 20
Credits:2		Exam: 80

Learning Objectives :

- To provide conceptual understanding of various numerical methods, in particular, with reference to numerical solution of non linear equations and system of linear equations, interpolation, numerical differentiation and integration and numerical solution of ordinary differential equations

Learning Outcomes

At the end of the course students will be able to

- solve an algebraic or transcendental equation using an appropriate numerical method
- solve a differential equation using an appropriate numerical method
- solve a linear system of equations using an appropriate numerical method
- Apply Numerical Concepts in Coding

12 Hrs.

UNIT-I

Errors in numerical computation – Errors and their computation.**Solution of Algebraic and Transcendental equations:** Introduction, the Bisection method, the method of False position, the Iterative method, Newton- Raphson method, Ramanujan's method. **Interpolation:** Introduction Finite differences- forward differences, backward differences, central differences, Newton's formula for interpolation, Lagrange's interpolation formula.**Divided differences** – Newton's general interpolation formula.

UNIT-II   12 Hrs.

Least Squares- Introduction, least squares curve fitting procedures – fitting a straight line, non-linear curve fitting, curve fitting by a some of exponentials. **Numerical differentiation and integration –** Numerical differentiation, integration – Trapezoidal rule, Simpson's 1/3 rule and Simpsons 3/8 rule.

<div align="center">**UNIT-III**   **12 Hrs.**</div>

Matrices and linear system of equation : Basic definitions, matrix operations, transpose of a matrix, the inverse of a matrix, matrix norms. **Solution of linear system: Direct methods-** Matrix inversion method, Gaussian elimination method, Gauss-**Jordan method, LU decomposition. Solution of linear systems – Iterative methods-** Gauss- Seidal methods Jacobi's method.

<div align="center">**UNIT-IV**   **12 Hrs.**</div>

Numerical solution of ordinary differential equation: Solution by Taylor's series, Euler's method,

Modified Euler's method, Runge – Kutta methods, Predictor- corrector methods - Adams – Moulton method, Milne's method, and Boundary value problems – Finite difference method. Bidirectional shift register.

Text Book:

1. S.S. Sastry, **Numerical Analysis**, 3rd edition, PHI publication

References Books:

1. M. K. Jain, S.R.K. Iyenger& R. K. Jain, **Numerical method for Scientific and Engineering computation**, 5th edition, New Age International publishers.
2. V Rajaraman, **Computer Oriented Numerical Methods**, 3rd Edition, PHI, 2006.

Group-I

Course-14

Theory : 4 hrs/week

Credits : 2

BCA 254-E3: BUSINESS MATHEMATICS & STATISTICS

48 Hours

IA   : 20

Exam : 80

Learning Objectives:

- Students will learn basic mathematical concepts like Set Theory &Vector Algebra and calculus and basic concepts on Statistics & Probability.

Learning Outcome:

- This foundation will help students in understanding analytical procedures used in Business Analytics.

UNIT – I   12 Hrs

Introduction to Sets, Sets, elements of a set, methods of describing a set, Tabular or Roster Method, Rule Method or Set Builder, Empty or Void or Null Set, Types of sets : Finite sets and Infinite sets, singleton, equal sets, subsets, Proper Subset, Power Set, Universal Set, Venn Diagrams, Operations on Sets, Union, Intersection of Sets, Disjoint Sets, Difference of two Sets, Symmetric Difference of Sets, Complement of a Set, De-Mogran's laws, Algebra of sets.

UNIT – II   12 Hrs

Vector Algebra: Vectors, Types of Vectors, Operations on Vectors, Addition of Vectors, Properties of Operation of Addition, Subtraction, Properties of Operation of Subtraction, Multiplication by a scalar, Orthonormal Bases, Product of Two Vectors, Scalar Product or Dot Product of Two Vectors, Properties of Scalar Product, Vector Product or Cross Product, Properties of Vector Product

UNIT – III   12 Hrs

Statistics: Introduction to Statistics, functions, importance of statistics, limitations. Scale of Measurement, Nominal, Ordinal, Interval & Ratio. Frequency Distribution, Bar Chart, Pie Chart, Histogram, Frequency Polygon, Ogive, Pareto Chart, Stem-and-leaf Chart, Scatter Plot, Measure of Central Tendency, Properties, Advantages and Disadvantages of Arithmetic Mean, Geometric Mean, Harmonic Mean. Positional Averages, Median, Quartiles, Deciles, Percentiles & Mode. Measure of Dispersion, Range, Interquartile Range, Standard Deviation.

Probability: Introduction to Probability, Experiment, Event, Compound Event, Independent and Dependent Events, Mutually Exclusive Events, Equally Likely Events, Marginal, Union, Joint, Conditional Probability, Basic Probability Rules, General Rule of Addition, General Rule of Multiplication, Concept of Baye's Theorem.

Text Books

1. **Dr Padmalochan Hazarika, Business Mathematics: A Textbook Of Business Mathematics,** 4/ed. **Chand publication,2014 .**

2. Sancheti and Kapoor's *Business Mathematics*, published by Sultan Chand and Sons,2010

3. Sancheti Kapoor, Business   Statistics, Sultan Chand & Sons,

References Books

1. Zameeruddin, Khanna & Bhambri Business Mathematics, Vikas publishing House, 2009

2. **Mittal ,Sathyaprasad and and Pradeep Kumar Rao,** Mathematics and Statistics for Management, Himalaya publisher, 2018.

3. Naval Bajpai, Business Statistics, Pearson Education, 2013.

Group-I Practical-VII	BCA 254 :Computer Graphics and Animation Lab	48 Hours
Practical/Week: 6 Hrs Credits: 2	Exercises on**Computer Graphics and Animation** programming	**I.A: 20 Exam: 80**

Practical-VIII	BCA 255: JAVA Lab	48 Hrs
Practical/Week: 6 Hrs Credits: 2	Exercises on **JAVA** Programming	**I.A: 20 Exam: 80**

| Group –II | ELECTIVE -IV: SKILL | 24 Hours |
| Cporse-8 | DEVELOPMENT | |

ELECTIVE -IV: SKILL DEVELOPMENT

BCA 256-E1: HARDWARE AND PC MAINTENANCE

Group –II
Cporse-8

Theory :2hrs/week
Credits : 1

24 Hours

IA : 10
Exam : 50

Learning Objectives:

- To build and maintain computer systems, desktops, and peripherals.
- To learn installing, diagnosing, repairing, maintaining, and upgrading Softwares

Learning Outcomes:

At the end of the course students will fully aware of

- Assembling Computer Systems
- Installing Various Operating Systems and other softwares
- Trouble suiting Computer Systems

UNIT - I   12Hrs

The Complete PC: External Connections, Devices and Their Connectors. Introduction to networking hardware: Crimping, Cabling and NIC Card Fixing, Setting up of a Local Area Network(User account creation, IP Address configuration, MAC Address, ARP Tables),Essential Networking Commands. Microprocessor: Selecting, Installing, and Troubleshooting. RAM: Type, Installing, Troubleshooting.

BIOS :Modify CMOS: The Setup Program, A Quick Tour Through a Typical CMOS Setup Program, Power-On Self Test (POST). Motherboards: Installing Expansion Cards, Upgrading and Installing Motherboards, Installing and Maintaining Power Supplies .Hard Drive Technologies: Installing Drives, BIOS Support: Configuring CMOS and Installing Drivers, Hard Drive Formatting, The Partitioning and Formatting Process, Installing Removable Media.

UNIT - II   12Hrs

Installing and Upgrading Windows: Preparing for Installation or Upgrade, Troubleshooting Installation Problems, Post-Installation Tasks. Windows7: The Windows Interface, Operating System Folders, Tech Utilities. Task Manager, Managing Users in Windows 7, Maintaining

Windows, Optimizing Windows, Preparing Windows for Problems, Failure to Boot: Windows 7 Installing and Configuring a Wired Network, Connecting to the Internet, Installing a Printer in Windows, Network Security.

Text Book:

1. Mike Meyers' CompTIA A+® Guide to Managing and Troubleshooting PCs Fourth Edition, 2016Publication - McGraw-Hill

References Books:

1. Balvir Singh, PC Hardware, Published by :Firewal Media, 2008.
2. Craig Zacker and Jhon Rourke, The Complete Reference PC Hardware, Tata McGraw-Hill Publishing Company Limited, 2001

Group-II		
Course-9	**ELECTIVE -IV: SKILL DEVELOPMENT**	**24 Hours**
Theory :2hrs/week	**BCA 2556-E2: DESKTOP PUBLISHING**	**IA :10**
Credits : 1		**Exam : 40**

Learning Objectives:

- To understand Documentation using DTP software tools like Page Make, CorelDRAW

Learning Outcome :

- At the end of the course the students will be able to produce documentation with combination of Text, Audio, Video and Images in in standard format

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UNIT - I   12Hrs

Page Maker: Introduction ToPagemaker Package. Preparation of Document Using DTP Package. , Page Maker Icon and help, Tool Box, Styles, Menus etc., Different screen Views, Importing text/Pictures, Auto Flow, Columns,Text Formatting, Different Page Layouts, Printing Various Fonts and Character Sets. Various types of Printers used in DTP.

Indian Language Fonts, Creation of Indian Language Fonts. Import & Export of Documents created by other Word Processors, Multi Page Document design , Assembling master Page , Assembling Booklet Cover , Assembling double page spread , Assembling backcover , Adding index entries , Generating and formatting Table of contents , Spelling Check, Designing exercise like Visiting Card, Letter head , Greeting Cards ,Advertising for Job , News Paper columns

UNIT - II   12Hrs

Corel DRAW: Introduction to Programs, Suite Interface, Page Setup, Viewing - DRAW / PAINT, Selecting and Moving – DRAW, Masks - PHOTO-PAINT, Transforming – DRAW, Drawing – DRAW, Shape Tools – PAINT, Editing Tools – DRAW, Fills – DRAW / PAINT, Outlines – DRAW, Objects – PAINT, Arranging Objects – DRAW, Text – DRAW, Text - PHOTO-PAINT, Interactive Tools, Miscellaneous – DRAW, Editing and Retouching – PAINT, Color Adjustment – PAINT, Filters – PAINT, Brushes Tools – PAINT, Input/Output - DRAW / PAINT, Other Programs.

Text Books

1. M C Sharma, Desktop Publishing on PC, BPB Publication, 2003
2. Adobe PAGE MAKER 7.0   Class Room in a Book Tec media Publications, 2002.
3. Gary David Bouton, CorelDraw X5 The Official Guide, Tata Mcgraw-Hill Edition, 2011.

Reference Books :

1. Shirish Chavan, Rapidex DTP Course,Unicorn Books Pvt Ltd, 2003

2. Chries DC La Nougerede, CorelDraw an Introduction, Dk Pub, 2002

| Group-II | ELECTIVE -IV: SKILL DEVELOPMENT | 24 Hours |
| Course-10 | | |

Group-II
Course-10
Theory :2hrs/week
Credits : 1

ELECTIVE -IV: SKILL DEVELOPMENT

BCA 256-E3: EXCEL PROGRAMMING WITH VBA

24 Hours

IA   : 10

Exam : 40

Learning Objectives

- To understand programming in Excel
- To familiarize Excel Macros
- To create Excel User Forms

Learning Outcome : At the end of the course the students will be able to

- Create Work Books with customized Macros
- Implement User Forms with different classes of controls
- Design Work Book with different functionality

| | UNIT - I | 12Hrs |

Introducing VBA : Start with the Macro Recorder, Working with VB Editor, VBA fundamentals, Working with Range Objects [Chapter-2]

VBA Programming Fundamentals – Overview, Comments, Variables, Data Types, Constants, Assignment Statements, Arrays, Object Variables, Built-in functions, Manipulating Objects and Collection, Controlling code execution [Chapter-3]

Working with VBA Sub Procedures – About Procedures, Executing Sub Procedures, Passing arguments to Procedures [Chapter-4]

Creating Function Procedures – Sub Procedures vs Function Procedures, An introductory Function example, Function Procedures [Chapter-5]

| | UNIT - II | 12Hrs |

Understanding Excel's Events – Know about events, Getting acquainted with workbook-level events, Examining worksheet events, Monitoring with application events [Chapter-6]

Introducing UserForms : Inserting new UserForm, Adding controls to a UserForm, ToolBox Controls, Displaying a UserForm, Closing UserForm, Creating a UserForm : an example, Understanding UserForm Events, Referencing UserForm Controls [Chapter-13]

UserFormExamples : Creating a UserForm "Menu", Selecting Ranges from a UserForm, Creating a Splash Screen, Disabling a UserForm's close button, Changing a UserForm's size, Zooming and Scrolling a sheet from a UserForm, ListBox Techniques [Chapter-14]

Text Book
1. Michael Alexander, Dick Kusleika, Excel 2016 Power Programming with VBA, John Wiley & Sons, 2017.

Group	Course Code	Course Particulars	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA301	Software Engineering	4	-	3	20	80	100	2
	BCA302	Computer & Communication Networks	4	-	3	20	80	100	2
	BCA303	Distributed Computing	4	-	3	20	80	100	2
	BCA304	Web Technology	4	-	3	20	80	100	2
	BCA305	Python Programming	4	-	3	20	80	100	2
	BCA306	E1:Accounting& Financial Management E2: Android Application Development E3: SciLab	4	-	3	20	80	100	2
	BCA307	Web Applications Lab	-	3	3	20	80	100	2
	BCA308	Python Programming Lab	-	3	3	20	80	100	2
	BCA309	E1:AFM Lab E2: AAD Lab E3: SciLab	-	3	3	20	80	100	2
		Total	**24**	**9**	**27**	**180**	**720**	**900**	**18**

Group I

Course-15

Theory : 4 hrs/week

Credits : 2

48 Hours

BCA 301: SOFTWARE ENGINEERING

IA   : 20

Exam : 80

Learning Objective:-

- To prepare students for successful careers in *software engineering* and graduate education with a thorough understanding of *software engineering*.

- To develop skills in software development so as to enable to take up self.

Learning Outcome:

- Be successful professionals in the field with fundamental knowledge of software engineering.

- Analyze and resolve information technology problems through the application of systematic approaches and diagnostic tools.

UNIT - I   12 Hrs

Introduction: The Problem Domain- Industrial Strength Software, Software is Expensive, Late and Unreliable, Maintenance and Rework, Software Engineering Challenges-Scale, Quality and Productivity, Consistency and Repeatability, Change, The Software Engineering Approach-Phased Development Process, Managing the process. **Software Processes:** Software Process-Processes and Process Models, Component Software Processes, ETVX Approach for Process Specification, Desired Characteristics of a Software Process-Predictability, Support Testability and Maintainability, Support Change, Early Defect Removal, Process Improvement and Feedback , Software Development Process Models-Waterfall Model, Prototyping, Iterative Development, Time boxing Model, Comparison of Models, Other software Processes-Project Management Process, The Inspection Process, Software Configuration Management Process, Requirements Change Management Process, Process Management Process.

UNIT - II   12 Hrs

Software Requirements Analysis and Specification: Software Requirements-Needs for SRS, Requirement Process, Problem Analysis -Informal Approach, Data Flow Modeling, Prototyping, Requirements Specification-Characteristics of an SRS, Components of an SRS, Specification Language, Structure of a Requirement Document, Validation. **Function**

Oriented Design: Design Principles-Problem Partitioning and Hierarchy, Abstraction, Modularity, Top-down and Bottom-up strategies, Module- Level Concepts-Coupling, Cohesion,, Design Notation and Specification-Structure Charts, Specification, Structured Design Methodology-Restate the Problem as a DFD, Identify the Most Abstract Input and Output Data Elements, First Level Factoring, Factoring the Input, Output and Transform Branches, Design Heuristics, Transaction Analysis, Verification.

UNIT - III   12 Hrs

Detailed Design: Detailed Design and PDL-PDL, Logic/Algorithm Design, State Modeling of Classes, Verification-Design Walkthroughs, Critical Design Review, and Consistency Checkers.

Coding: Programming Principles and Guidelines-Common Coding Errors, Structured Programming, Information Hiding, Some Programming Practices, Coding Standards, Verification-Code Inspections, Static Analysis, Proving Correctness, Unit Testing, Combining Different Techniques.

UNIT - IV   12 Hrs

Testing and Testing Tools: Testing Fundamentals-Error, Fault and Failure, Test Oracles, Test Cases and Test Criteria, Psychology of Testing, Black Box Testing- Equivalence Class Partitioning, Boundary Value Analysis, Cause-Effect Graphing, Pairwise Testing, Special Cases, State-Based Testing, White Box Testing-Control Flow Based Criteria, Data Flow Based Testing, Mutation Testing, Test Case Generation and Tool Support, Testing Process-Levels of Testing, Test Plan, Test Case Specification, Test Case Execution and Analysis, Defect Logging and Tracking. **Introduction to Testing tools:** Overview of WinRunner, Silk Test, SQA Robot, Load Runner, JMeter and Test Director (*relevant sections only*).

Text Books:

1. PankajJalote, **An Integrated Approach to Software Engineering**, 3rd Edition, Narosa Publishing House.

2. Dr. K.V.K.K. Prasad, **Software Testing tools**, Dreamtech Press.

Reference Books:

1. Roger S. Pressman, **Software Engineering: A Practioner's Approach**, McGraw Hill, 2009

2. K KAggarwal, Yogesh Singh, **Software Engineering**, 1st edition, New Age International Pvt Ltd Publishers

3. RenuRajni, **Software Testing: Methodologies, Tools and Processes**, Tata McGraw hill education.

Group I

Course-16

Theory : 4 hrs/week

Credits : 2

48 Hours

BCA302: COMPUTER & COMMUNICATION NETWORKS

IA   : 20

Exam : 80

Learning Objectives

- To introduces students to computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).

Learning Outcome :

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

- Understand the architectural principles of computer networking and compare different approaches to organising networks
- Explain key networking protocols and their hierarchical relationship in the context of a conceptual model such as the OSI and TCP/IP framework
- Identify core networking and infrastructure components and the roles they serve.

UNIT - I   12 Hrs

Introduction – Computer Network, Elements of CN, Internet, Fundamentals of Data & Signals, Network Topologies, Network OS, Transmission Medium, Types of Networks, Connection-oriented & Connection-less services, Segmentation & Multiplexing, Network Performance, Network Switching. **OSI and TCP/IP Models** –Protocol Stack, OSI Model, TCP/IP Model, Difference between OSI & TCP/IP Models, How does TCP/IP Model Work?, Understanding Ports, **Networking Devices** – End Devices, Intermediary Devices, Connectivity Devices, Internetworking Devices

UNIT - II   12 Hrs

LAN Technologies – Introduction, Types of Network Links, Medium Access Control Techniques, Random Access Techniques, Static Channelization Techniques, Ethernet, Token Ring. **ARP & RARP** – ARP, RARP. **IP Addressing** – Introduction, What is an IP Address, Understanding IP Address, Why do we need IP Addresses?, IPv4 vs IPv6, Classful Addressing, IPv4 Addressing Types, IPv4 Reserved Addresses, Packet Flow in an IPv4 Network, IPv4 Datagram Header Format, IPv4 Fragmentation, Limitations of IPv4 Classful

Addressing, Subnet Masks and Subnetting, Supernetting and classless Inter-Domain Routing, IPv6, IPv6 Addressing Notation, IPv6 Addressing Types, Unicast IPv6 Addresses, Multicast IPv6 Addresses, Anycast IPv6 Addresses, IPv6 Datagram Header Format

UNIT - III   12 Hrs

Wireless Networks and Mobile IP – Infrastructure of Wireless Network, Wireless LAN Technologies, IEEE 802.11 Wireless Standard, Cellular Networks & Connectivity, Generations of Cellular Systems, Mobile IP, Wireless Mesh Networks (WMNs). **IP Routing** – Introduction, Classification of Routing Algorithms, Routing Algorithm Metrics, Internet Architecture, Autonomous Systems, Routing Protocols, RIP, OSPF, BGP. **TCP & UDP** – Introduction, TCP & UDP, TCP/IP Terminology, Ports and Sockets, User Datagram Protocol, Transmission Control Protocol, Comparison of TCP & UD

UNIT - IV   12 Hrs

Session Layer- Introduction, Session Layer Tasks, Session Layer Services, RPC Protocol, Major Session Layer Protocols. **Presentation Layer** – Introduction, Presentation Lauer Tasks, Data Conversion, Data Representation, Data Compression, Data Encryption. **Application Layer Protocols** – Introduction, HTTP, SNMP, FTP, DNS, TFTP, DHCP, **Network Security** – History of network security, Pillars of Network security, Glossary of Network Security Terms, Network Security Components, Types of Attacks, Known security attacks, Cryptography, Types of Ciphers, Encryption and Decryption, Hashing, Digital Signature, Firewalls

Text Books

1. NarasimhaKarumachi, A Damodaran, M. SreenivasaRao, Elements of Computer Networking – An Integrated Approach,CareerMonk Publications, 2014
2. Nader F. Mir, Computer and Communication Networks, Pearson, 2015

Reference Books

1.Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5th Edition, 2014.

2.Douglas E. Comer, Internetworking with TCP/IP Volume One, Pearson, 6th Edition, 2014.

Group I

Course-17

Theory : 4 hrs/week

Credits : 2

BCA 303: DISTRIBUTED COMPUTING

48 Hours

IA : 20

Exam : 80

Learning Objectives

- To study concurrent, Client Server, distributed paradigms
- To learn Interposes Communication and Remote procedure calls.

Learning Outcomes :

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

- Understand Concepts behind Distributed Systems
- Design and build application programs on distributed systems.
- Develop, test and debug RPC based client-server programs

UNIT - I   12 Hrs

Introduction, Definition,History, Different Forms Of Computing,Strengths And Weakness,Basics Of Operating System,Network Basics, Software engineering basics,InterprocessCommunications,An archetypal IPC Program interface, event synchronization, timeouts and threading, deadlocks and timeouts, data representation, data encoding,text based protocols, request response protocols, event diagram and sequence diagram, connection oriented versus connectionless IPC, The evolution of paradigm for interprocess communication.

UNIT - II   12 Hrs

Distributed computing paradigms,Paradigms and abstraction, An example application,paradigms for distributed applications, tradeoffs,The socket API, Background, the socket metaphor in IPC, The datagram socket API ,The stream mode socket API, The socket with non-blocking I/O operations, secure socket API.

Client server paradigm-issues, software engineering for a network service, connection oriented and connectionless servers, iterative server and concurrent server, tasteful servers,Group communication- unicasting and multicasting, multicast API, connection oriented versus connectionless multicast, reliable multicast versus unreliable multicasting, the java based multicast API, reliable multicast API.

UNIT - IV   12 Hrs

Distributed objects-message passing versus distributed objects, an archetypal distributed object architecture, Distributed object system, remote procedure calls, Remote method invocation, The Java RMI architecture, The API for Java RMI, A sample RMI Application, Steps for building an RMI applications, testing and debugging, comparison of RMI and socket and socket APIs, Advanced RMI - client callback, stub downloading, RMI security manager.

Text Book

M.L.Liu, Distributed Computing-Principles and Applications , Pearson Education, 2004.

Reference Books

1. MukeshSinghal, NiranjanG.Shivaratri, Advanced Concepts in Operating System, Tata McGraw Hill
2. WillaimGrosso, Java RMI, Shroff/O'reilly, 2002

Group I

Course -18

48 Hours

BCA 304: WEB TECHNOLOGY

Theory : 4 hrs/week

IA   : 20

Credits : 2

Exam : 80

To educate students in web application development and make them aware on programming webapplication in different technologies like ASP .NET with C# and PHP

Learning Objectives:

- To provide in-depth understanding of the tools and technologies necessary for Web application design and development.

- To make the students understand client side scripting like HTML, server side scripting like s, ASP,PHP and database interfacing.

Learning Outcomes:

- Have a sound knowledge of Web Application Terminologies, Internet Tools

- Select and apply markup languages for processing, identifying, and presenting information in web pages.

- Use scripting languages and web services to add interactive components to web pages.
  ☐ Design and implement websites with good aesthetic sense of designing

- Design to be reusable the software components in a variety of different environments.

UNIT - I	**12 Hrs**

An Introduction to HTML5: What is HTML5,New Structural Elements, New Inline Elements New Form Input Types. The HTML5 Doctype Element. **Drawing with the canvas Element**:Using the HTML5 Element – Canvas, Drawing Rectangles, Drawing Line Art, Filling Line Art, Drawing Arcs, Drawing Text, Drawing With Bezier Curves, Drawing with Quadratic Curves. **Video on Web**: Video Codecs, Audio Codecs, HTML5 <video> Markup. **Building Forms In HTML5**:Placeholder Text, Autofocus Fields, Email Addresses, Web Address, Using Numbers, Numbers as sliders, Date Pickers, Search Boxes, Color Pickers. **Overview of C#:** Introduction to C#, A sample C# program, namespaces, Using aliases for namespace classes. Literals Variables and Data types,Operators and Expressions,Decision making and branching,Decision making and looping,Methods in C#,Classes and Objects.

<div align="center">**UNIT - II**   **12 Hrs**</div>

Introduction to ASP .NET: ASP .NET Definition, Features of ASP .NET, Characteristics of ASP .NET web Forms, Types of ASP .NET Web Server Controls. **ASP .NET Standard Controls** – TextBox, Button, Label, Image, ImageButton, DropDownList, CheckBox, CheckBoxList, RadioButton, RadioButtonList, Panel, AdRotator, Calender, HyperLink Controls. **Validation Controls** – BaseValidator Class, Required Field Validator, RangeValidator, CompareValidator, RegularExpression Validator, Validation Summary Control.

ADO .NET – ADO .NET objects, DataSource Controls, DataBound Controls (Except Repeater and Chart Controls)

<div align="center">**UNIT - III**   **12 Hrs**</div>

PHP Crash Course :Creating a Sample Application: Bob's Auto Parts, Embedding PHP in HTML,Adding Dynamic Content, Accessing Form Variables, UnderstandingIdentifiers, Examining Variable Types, Declaring and Using Constants,Understanding Variable Scope. The Error Suppression Operator, the Execution Operator, The Type Operator. Testing and Setting Variable Types (only gettype() and settype(). Breaking Out of a Control Structure or Script, Using declare, Next. **Storing and Retrieving Data:**Processing Files :Opening a File, Writing to a File, Closing a File, Reading from a File. **Using Arrays,String Manipulation and Regular Expressions:** Numerically Indexed Arrays, Arrays with Different Indices,Array Operators, Multidimensional Arrays, Sorting Arrays, Sorting Multidimensional Arrays, Reordering Arrays, Loading Arrays from Files, Performing Other Array Manipulations, Counting Elements in an Array: count(), sizeof(), and array_count_values(). **String manipulation and Regular expressions:** Formatting Strings, Joining and Splitting Strings with String, Functions, Comparing Strings, Matching and Replacing Substrings with String Functions, Introducing Regular Expressions.

<div align="center">**UNIT - IV**   **12 Hrs**</div>

Object-Oriented PHP :Creating Classes, Attributes, and Operations in PHP.Implementing Inheritance in PHP, Overriding, Implementing Interfaces(excluding Preventing Inheritance and Overriding with final,Understanding Multiple Inheritance), Understanding Advanced Object-Oriented Functionality in PHP. **Accessing Your MySQL Database from the Web**

with PHP : How Web Database Architectures Work, Querying a Database from the Web, Putting New Information in the Database, Using Prepared Statements, Using Other PHP-Database Interfaces. **Interacting with the File System and the Server :**Uploading Files, Using Directory Functions, Interacting with the File System, Using Program Execution Functions.

Text Books:

1. Ivan Bayross, HTML5 and CSS3 made simple, BPB Publications.
2. E Balagurusamy, Programming in C#, 3rd Edition, TMH
3. ASP .NET 4.0 in simple steps, Kogent publications
4. Luke Welling, Laura Thomson, PHP and MySQL Web Development, Developer's Library, Sams Publishing

Reference Books:

1. Jason Hamilton, C# Programming: Quickly Learn C# Programming, 2016
2. C. Komalavalli and Sanjib K. Sahu, Essentials of .NET programming, Ane' Student Edition, 2015
3. Steven Holzner,Sams Teach Yourself HTML5, SAMS publication, 2011
4. Bill Evjen, Scott Hanselman, Devin Rader, Professional ASP .NET 4 with C# and VB,.WileypublishngIncor[oration,2010
5. Steven Holzner, PHP the Complete Reference, McGraw Hill , 2007

Group I	**BCA 305:PYTHON PROGRAMMING**	**48 hours**

Course-19

Theory : 4 hrs/week   **IA: 20,**

Credits : 2   **Exam: 80**

Learning Objectives:

To Study Python Fundamentals to advanced concepts like OOPS , Exception handling, multi-threading ,Networking , Database Connectivity and Graphical User Interface

Learning outcomes:

Be skilled at creating, debugging and testing a software application using the Python programming language.

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UNIT I   **12 Hrs**

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Introduction to Python :Features of Python , , Flavors of python , Python Virtual machine , Memory management , Garbage Collection , Comparison between Python and C , Java and Python**.** Installing Python for windows , Writing and executing Python program .**Datatypes& Operators in Python** : Writing comments , docstrings , Built in data types –None type , numeric type , sequences ,sets and mappings. Literals ,Determining data types of variable ,naming conventions in Python,   **Operators:** Arithmetic, Assignment , relational ,logical ,Boolean , Bitwise, membership & Identity Operators. Using Python interpreter as Calculator Mathematical functions.**Input& Output:** Input/output Statements, Command line arguments. **Control Statements** – if ,if..else , if..elif , while loop , for loop , else suite, break , continue ,assert , return Statements. **Arrays in Python**- Creating arrays , Importing array module , Indexing and slicing on arrays ,Processing the arrays , types of arrays , working with arrays using numpy. Creating array using linspace() , logspace() , arrange() , zeros() and ones() functions. Mathematical operations on arrays, Comparing arrays, Aliasing ,viewing and copying arrays. Dimensions and attributes of Array. Working with multidimensional arrays, indexing and slicing, matrices in numpy.

UNIT II   12 Hrs

Strings and characters-Creating, indexing , slicing ,repeating , concatenating & comparing strings. Finding and counting substrings in string ,Replacing ,splitting and joining strings, Working with characters.

Functions – Functions and methods , Defining , calling functions, returning multiple values , formal and actual parameters , Keyword argument Default arguments and variable argument. , Local and Global variables , Anonymous functions and Lambdas, **Lists and Tuples :** Creating , updating ,concatenating lists ,Repetition of list ,Aliasing and cloning lists , Sorting lists , Nested lists , Tuples ,Creating and accessing tuple elements, Basic operations on tuples ,Functions to process tuples , Nesting ,inserting ,modifying and deleting tuple elements.
Dictionaries: Operations on Dictionaries , Dictionary methods ,Sorting elements of dictionary ,Converting list and strings into Dictionary.

UNIT III   12 Hrs

Classes and Objects-Defining class &Objects, constructors , type of methods and variables , Inner classes.

Inheritance and Polymorphism : Type of Inheritance , super() method , method overloading & Overriding ,Abstract classes and interfaces.**Exception Handling** –Type of exceptions , assert Statement , Except Block ,User defined exceptions , logging the exceptions.**Regular expressions:** Sequence characters , Quantifiers & Special characters in regular expressions.
Creating Threads –Different ways of creating threads ,   Thread class methods ,Thread Synchronization-Locks ,semaphore ,Communication between threads , Daemon Threads.

UNIT IV   12 Hrs

Graphical User Interface : Root window ,font& colors , Canvas and frames. Widgets: Button , Label ,Message , Text, Scrollbar, Chekcbutton,Radiobutton ,Entry,Spinbox,Listbox and Menu ,Creating Tables.

Networking in Python : Reading source code of web page , Downloading webpage and images ,TCP/IP server , TCP/IP Client , UDP Server, UDP client , File Server , File Client ,two way communication between server and client , Sending simple mail.   **Database Connectivity:** Types of databases used with Python , Using MySQL from Python ,Retrieving and Inserting , updating and deleting data in a table ,Creating Database tables through Python. Using Oracle database from Python Stored Procedures.

Text Book:

1. Core Python Programming by , Dr. R. Nageshwara Rao Dreamtech Press , Second Addition.

Reference Books :

1. Python The Complete Reference by Martin C. Brown ,McGraw Hill Education
   Programming in Python

2. Complete Introduction to Python Language By Mark Summerfield , Second Edition.

Group I		48 hours
Course-20	**BCA306-E1:ACCOUNT&**	
Theory : 4 hrs/week	**FINANCIAL MANAGEMENT**	IA: 20,
Credits : 2		Exam: 80

Learning Objectives :

- To provide Basic knowledge of Accounting ,competency to enter accounting transactions in the accounting software and generate different accounting reports/documents.
- Abilities to make cost analysis reports, profit & loss accounts, balance sheets, and cash flow statements etc.
- skills in maintaining accounting records, provides in-depth exposure to accounts receivable/ accounts payable, payroll and inventory modules.

Learning Outcomes :

- Apply skills in Computerized Accounting for maintaining accounting records, making management decisions, and processing common business applications

UNIT I	12 Hrs

Excel Advanced Concepts

Excel & the Internet: E Mail Merge from Excel, Functions: Drop Down List, Dates, Whole Numbers, Decimals, VLOOKUP, Macros, IF Functions, Using Functions to Clean & Crunch data: Protection, Locked Cells, Hidden Cells, Links to other worksheets or workbooks, Data Commands, Solver, Using Excel with Your Accounting System.

UNIT II	12 Hrs

Manual Accounting: Need for accounting, types of accounts, rules for debit and credit, accounting principles and standards, accounting systems, definitions and terms, recording transaction in a journal, ledger, trial balance, final accounts, adjustment entries. Feature of Tally, requirements for installing, procedure for installing.Salient Features - Company Creation - Ledger Creation with predefined Primary Groups,Predefined Sub Groups and New Sub Groups,cost categories (single mode, expert usage) and cost centers.

12 Hrs

Inventory Masters and Reports in Stock Summary and Statements of Inventory - Accounting Voucher Entries - Creation of additional voucher types - Simple classes in Accounting Vouchers - Inventory Voucher Entries -Using Various references in Bill wise Accounting for Trading and Non Trading Accounts

Age wise Analysis - Payment Performance of debtors - Bank Reconciliation Statement - Reporting and Printing:Trial balance, balance sheet, profit and loss account, stock summary, ratio analysis, display menu, day book. **Important features of Tally:** Multiple currencies and foreign exchanges, rates of exchange, budget, scenario management, security control in tally, splitting company data, group companies, tally audit, tally interface, tally ODBC, backup and restore.**TDS Module:** Enabling TDS in tally, ledger pertaining to TDS, creating TDS voucher types, voucher entry, TDS reports, challan, TDS computation, TDS payables, ledger out standings

Text Book:

1. Kogent Learning Solutions mc, Tally. ERP 9 in Simple Steps, Dreamtech Press *

2. Tally 7.2 course kit - NamrataAgrawal, Sanjay Kumar, Dreamtech Press*

3. Tally 9.0 - Dinesh Maidasani, Laxmi Publication

References Books:

1. Nadhani, Tally. ERP 9 Training Guide, BPB

2. Vikas Gupta, Comdex Computer and Financial Accounting with Tally 9.0, Wiley India Pvt Ltd, 2010

Group I	**BCA 306-E2:ANDROID**	**48 hours**
Course-21	**APPLICATION DEVELOPMENT**	
Theory : 4 hrs/week		**IA: 20,**
Credits : 2		**Exam: 80**

Learning Objectives :

- To provide the basic knowledge about mobile application development in Android platform.
- To make the students aware about how to build applications to mobile devices and thus preparing them to be ready for the industry.

Learning Outcomes :

- Apply the skills for creating, deploying Android applications, with particular emphasis on software engineering topics including software architecture, software process, usability, and deployment.
- To use the knowledge of android architecture and the tools for developing android applications

UNIT I	12 Hrs

Getting an Overview of Android: Introducing Android: Listing the Version History of Android Platform, Discussing Android APIs, Describing the Android Architecture, Application Framework, Exploring the Features of Android.Discussing about Android Applications: The Application Components, The Manifest File.Downloading and Installing Android: Downloading and Installing the Android SDK, Setting up Android Virtual Device, Setting up Android Physical Device.Exploring the Development Environment: The Java Perspective Using Eclipse, The DDMS Perspective.Developing and Executing the First Android Application: Using Eclipse IDE to Create an Application, Running Your Application, Exploring the Application.

Using Activities, Fragments, and Intents in Android:Working with Activities: Creating an Activity, Starting an Activity, Managing the Lifecycle of an Activity, Applying Themes and Styles to an Activity, Displaying a Dialog in the Activity, Hiding the Title of the Activity.

Using Intents: Exploring Intent Objects, Exploring Intent Resolution, Exploring Intent Filters,

Resolving Intent Filter Collision, Linking the Activities Using Intent, Obtaining Results from Intent, Passing Data Using an Intent Object.Fragments: Fragment Implementation, Finding Fragments, Adding, Removing, and Replacing Fragments, Finding Activity Using Fragment, Using the Intent Object to Invoke Built-in Application.

Working with the User Interface Using ViewGroups: Working with View Groups: The LinearLayout Layout, The RelativeLayout Layout, The ScrollView Layout, The TableLayout Layout, The FrameLayout Layout, The TabLayout Using the Action Bar.

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UNIT II   **12 Hrs**

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Working with the User Interface Using Views: Working with Views: Using the TextView, Using the EditText View, Using the Button View, Using the RadioButton View, Using the CheckBox View, Using the ImageButton View, Using the ToggleButton View, Using the RatingBarView.Binding Data with the AdapterView Class: Using the ListView Class, Using the Spinner, Using the Gallery View.Designing the AutoTextCompleteViewImplementing Screen Orientation: Anchoring the Views of the Current Activity, Customizing the Size and Position of the Views.Designing the Views ProgrammaticallyHandling UI Events: Handling User Interaction with Activities, Handling User Interaction with the View.Specialized Fragments: ListFragment, DialogFragment, PreferenceFragment.Creating Menus: The Options Menu, The Context Menu, TheSubMenus.

Handling Pictures and Menus with Views: Working with Image Views: Displaying Images in the Gallery View, Displaying Images in the Grid View, Using the IimageSwitcherView.Designing Context Menu for Image View.Using the AnalogClock and DigitalClockViewsEmbedding Web Browser in an ActivityNotifying the User: Creating the Toast Notification, Creating the Status Bar Notification, Creating the Dialog Notification.

Storing the Data Persistently: Introducing the Data Storage Options: Using Preferences, Using the Internal Storage: Exploring the Methods Used for Internal Storage, Developing an Application to Save User Data Persistently in File.Using the External Storage: Exploring the Methods Used for External Storage, Developing Application to Save File in SD Card.Using the SQLite Database: Creating the Database Helper Class, Creating the Layout and Main Activity Class, Creating the Layout and Activity for the Insert Operation, Creating the Layout

and Activity to Search a Record, Creating the Activity Class to Fetch All Records, Creating the Layout and Activity for the Update Operation, Creating the Layout and Activity for the Delete Operation, Executing the Database Operations.Working with Content Providers: Exploring the android provider Package, Creating User-Defined Content Provider, Consuming User-Defined Content Provider.

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UNIT III   **12 Hrs**

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Working with Location Services and Maps: Working with Google Maps: Exploring Google Maps External Library, Creating an Application Using Google Maps Android API, Disabling the Zoom Control Button, Changing the Map Type, Displaying the Specific Location and Adding Markers, Handling Map Gestures Interaction, Getting the Current Location of a User. Working with Geocoding and Reverse Geocoding.

Working with Graphics and Animation: Working with Graphics: Drawing Graphics to CanvasUsing the Drawable Object: Referencing an Image File, Defining Drawable in XML.Using the ShapeDrawableObject.Working with the NinePatch Drawable Graphics. Understanding the Concept of Hardware Acceleration. Working with Animations: The Property Animation, View Animation, Drawable Animation.

Audio, Video, and Camera: Role of Media Playback, Using Media Player: Media Formats Supported by Media Player, Preparing Audio for Playback, Preparing Video for Playback, Creating Application to Play Audio and Video Using MediaPlayer. Recording and Playing Sound: Use of Media Store, Audio Recording Application.Creating a Sound Pool.Using Camera for Taking Pictures.Recording Video: Creating Video Recording Application.

Threads and Services: Introducing Threads: Worker Threads, Using AsyncTask, Introducing Services: Exploring Services Essentials, Understanding the Lifecycle of a Service, Exploring the Service Class, Introducing the Service Class, Creating a Bound Service.

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UNIT IV   **12 Hrs**

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Telephony and SMS: Handling Telephony: Displaying Phone Information Application, Receiving Phone Calls Application, Making Outgoing Phone Calls Application.Handling SMS: Sending SMS Using SmsManager.Sending SMS Using Intent: Receiving SMS Using the BroadcastReceiver Object, Role of Default SMS Providers.

Hardware Sensors: Introducing Sensors: Exploring the Sensor Framework, Managing Various Sensor Configurations, Understanding the Sensor Coordinate System.Using Sensors.

Widgets and Live Wallpapers in Android: Home Screen Widgets: Adding the Broadcast Receiver Class to an Android Manifest, Using the RemoteViews and AppWidgetManager Classes, Creating a Customized Clock Widget.Collection View Widgets: Collection View Widget Layouts, Creating the Remote Views Service Class, Creating a Remote Views Factory Interface, Populating Collection View Widgets.Live Wallpaper: Creating Live Wallpaper Resource and Service, Configuring Wallpaper Service, Creating Live Wallpaper Application.

Text Book:

1. Pradeep Kothari, Android Application Development (With KitKat Support) – Black Book, DreamTech Press.

References Books:

1. Barry Burd, Android Application Development for Dummies
2. Brian Hardy, Bill Phillips, Android Programming: The Big Nerd Ranch Guide

Group I 48 hours

Course-22

Theory : 4 hrs/week **BCA 306-E3: SCI LAB PROGRAMMING** **IA: 20,**

Credits : 2 **Exam: 80**

Learning Objectives :

- Familiarization of the syntax, semantics, data-types and library functions of numerical computing language such as MATLAB and/or SCILAB, and application of such languages for implementation/simulation and visualization of basic mathematical functions relevant to electronics applications.

Learning Outcomes :

On successful completion of the course, the students should be able to

- . Understand the need for simulation/implementation for the verification of mathematical functions.

- . Understand the main features of the SCILAB program development environment to enable their usage in the higher learning

- Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using /SCILAB tools.

UNIT I	12 Hrs

Overview of Scilab: How to get and install Scilab,InstallingScilab under Windows,InstallingScilab under Linux, Installing Scilab under Mac OS,Mailing lists, wiki and bug reports, Getting help from Scilab demonstrations and Macros.**Basic element of the language:** Creating Real Variables, Variable names, Comments and continuation lines, Elementary mathematical functions,Pre-defined mathematical variables, Booleans, Complex Numbers, Integers,Floating of integers,The answer variable, Strings, Dynamic types of variables.**Matrices:**Overview,Create a matrix of Real value, The empty matrix "[ ]",Query matrices,Accessing the elements of matrix,The colon ":" operator,The eye matrix, Matrices are Dynamic, The Dollars "$" operator, Low-level operations,Element wise operations, Conjugate transpose and non- conjugate transpose,Multiplication of two vectors, Comparing two real matrices, Issues with floating point integers, More on elementary functions, Higher-level linear algebra features.

Looping and Branching: The if- statement, The select statement, The for statement, The while statement, The break and continuous statement .

UNIT II   12 Hrs

Functions: Defining a Function, Functionlibraries, Managing Output Argument, The level in the call stack, The Return statement, Debugging functions with pause. **Plotting:** Overview, 2D plots, Contourplots, Titles, Axes and Legends, Exports. **ScilabGUI:** How a graphical user interface works, creating and displaying a graphical user interface, Object properties, Graphical user interface components, Additional containers: Panels and button groups, Dialog Boxes, Menus, Tips for creating efficient GUIs. **DataAnalysis:** Basic Statistical Analysis, BasicDataAnalysis, Data Analysis and Statistical Functions **DataInterpolation:** One dimensional Interpolation , two dimensional Interpolation, Triangulation and Scattered Data **CubicSplines:** Basic Features Pricewise polynomials, Cubic Hermite Polynomials, Integration, Differentiation, Spline Interpolation on a Plane. **FourierAnalysis:** Discrete Fourier Transform, Fourier Series. **DifferentialEquations:** IVP Format, ODE Suite Solvers, Basic use, Setting options, BVPs, PDEs and DDEs.

UNIT III   12 Hrs

Digital Image Fundamentals: Light, Brightness adoption and discrimination, Human visual system, Image as a 2D data, Imagerepresentation. Gray scale and color images, Image sampling, And quantization,

Image Enhancement and filtering in spatial Domain: Intensity transformation function: Constructstretching, Thresholding, Imagenegative, Logtransformation, Power-low transformation, Intensity level slicing & bit – plane slicing, Image histogram.   Histogram equalization process fundamentals of spatial filtering. Correlation and convolution spatial filtering. Mask for low pass-filtering(smoothing). High pass filtering (sharpening). **Image filtering in the frequency domain:** Preliminary concepts, extension to functions of two variables, Imagesmoothing, Imagesharpening, Homomorphic   filtering, 2D-DFT, 2D-FFT, 2D-DCT, Fundamentals of 2D- wavelet transform, Imagepyramids, Sub-band coding.   **Image Restoration:**   Reason for image degradation, Model of image degradation/restoration process, Noise probability density function, Image restoration using spatial filtering (Mean filters, Order Statistic filters and Adaptive filters), Inverse filtering, MMSE (wiener) filtering.

Color Image Processing: Color Fundamentals, Color Modals, Pseudo-color image processing.

Image compression: fundamentals of redundancies, basic compression method-Huffman coding, arithmetic coding, LZE coding, JPGE compression standard, Wavelet based image compression. **Image Segmentation:** Edge based segmentation, Region based segmentation, Region split and merges techniques, Region growing by pixel aggregation, Optimal thresholding. **Morphologic image processing:** Basic Morphological operations, Erosion, Dilution, Opening, Closing, Structuring elements, Hit-or-miss transform basic Morphological algorithms: Hole filling, Connected components, thinning, Skeletons, Reconstruction by erosion and dilation.

Text Books:

1. Nagar, Sandeep, Introduction to ScilabFor Engineers and Scientists, Apress Publication, 2017

2. Kothari, Ashish M,Digital Image Processing using SCILAB, Springer publication, 2019.

3. Duane Hanselman Bruce Littlefield, Mastering MATLAB7, Pearson Education India, 2005

References Books:

1. TejasSheth,A Practical Introduction to Programming and Problem Solving using Scilab, Create Space Independent Publishing Platform, 2016

2. Stephen J Chapman , Programming in MATLAB for Engineers, Thomson Publication, 2008

3. JayadeepChakaravorty, Introduction To MATLAB Programming TOOLBOX AND SIMULINK, Orient Black Swan, 2014

Group-I Practical-IX	BCA 307 :Web Application Lab	48 Hours
Practical/Week: 6 Hrs Credits: 2	Exercises on**Web Application** programming	I.A: 20 Exam: 80

Practical-X	BCA 308: Python Programming Lab	48 Hrs
Practical/Week: 6 Hrs Credits: 2	Exercises on **Python Programming**	I.A: 20 Exam: 80

Practical-XI	BCA 309-
	    E1:AFM Lab
	    E2: AAD Lab
	    E3: SciLab
		48 Hrs

Practical/Week: 6 Hrs Credits: 2	Exercises on any one of the above selected Elective	I.A: 20 Exam: 80

VI SEMESTER BCA

Group	Course Code	Course Particulars	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
						IA	Exam	Total	Credits
I	BCA351	E-Commerce	4	-	3	20	80	100	2
	BCA352	Network Security & Management	4	-	3	20	80	100	2
	BCA353	Software Testing	4	-	3	20	80	100	2
	BCA354	**Elective II:** E1: Programming for Analytics E2: Multivariate Data Analysis E3: Business Statistics with R E4: LAMP Technology	4	-	3	20	80	100	2
	BCA355	Project Work	-	20	3	100	Reports - 300 Presentation and Viva - 100 Total: 400	500	10
		Total	**16**	**20**	**15**	**180**	**720**	**900**	**18**

BCA 351: E-COMMERCE

Learning Objectives

Introduce concepts and principles E-commerce, modern technologies used to simplify business and banking processes through e- commerce, provision of E-commerce services, infrastructure, frameworks of web based and mobile systems for E-Commerce applications

Learning Outcome :

At the end of the course the students will be fully aware of:

- the principles and practice of Electronic Commerce
- the components, functions and roles of the Electronic Commerce environment
- E-Commerce payment systems.

UNIT I   12 Hrs

Introduction to Electronic Commerce: The meaning, benefits, impact, Classification (B2B, B2C, C2C, B2G), application of Electronic Commerce technologies.**Electronic Commerce:** What isBusiness model, Taxonomy of business models of E-Com.

UNIT II   12 Hrs

Electronic Data Interchange: Themeaning of EDI, building blocks of EDI system, layered architecture, value added networks, benefits and application of EDI.**Electronic Commerce:** Architectural framework**.**

Electronic Payment System: Introduction to payment system, online payment system, prepaid and postpaid (e-Cash and Cyber Cash) electronic payment systems, requirement metrics of a payment system.

UNIT III   12 Hrs

Electronic Commerce: Network infrastructure: LAN, Ethernet LAN, WANs, Internet, TCP/IP reference model, Domain Name systems, and Internet industry structure.**Information distribution and messaging:** FTP application, Email, WWW server, HTTP, Web Servers implementation.

Electronic Commerce: securing the business on Internet: Vulnerability of information on Internet, security policy, procedures and practices, site security, protecting the network – Denial of service, Sniffing, Spoofing and Firewalls.**Electronic Commerce: Securing the business on Internet:** transaction security, Cryptology- Conventional Encryption model, Public key cryptosystems, digital signature, email security.

Mobile Commerce: Introduction, Architectural Framework and models,meaning, benefits, impediments, 1G, 2G and 3G networks.

Text Book:

1. Bharat Bhaskar, **Electronic Commerce: Framework, Technologies and Applications**, 4th edition, McGraw Hill company, 2014

Reference Books:

1. C. S. V. Murthy, **E-commerce: Concepts, Models, Strategies**, Himalaya Publishing House, 2011
2. Ravi Kalakota, Andrew B. Whinston, **Frontiers of Electronic Commerce**, Addison-Wesley Publications, 2000

Group I	BCA 352: NETWORK SECURITY &	
Course-24	MANAGEMENT	48 hours
Theory/Week 4 Hrs		I A: 20
Credit :2		Exam: 80

Learning Objectives:

- To provide in-depth knowledge of network Security , Database Security , information Security and Security laws.
- Provide knowledge Basic cryptography Concepts.
- To provide knowledge of Network Security Management

Learning Outcomes :

At the end of the course, students will be aware of

- Various factors driving the need for network , Database and information security
- Physical points of vulnerability in a networks
- Various laws related to Information Security

UNIT I   12 Hrs

Introduction to Network Security : why network security is needed , management principles ,security principles ,network management ,security attacks , organizational policy & security – security policies ,standards & guidelines ,information policy , Security policy , Physical security ,Security procedures , Network security planning , implementing a security policy.**Security infrastructure** – Components ,Goals ,design guidelines ,models. **Cryptography** – Terminology &background ,Data encryption methods ,cryptographic algorithms ,secret key cryptography – Stream ciphers ,Block ciphers (DES algorithm ,Triple DES) , Code –Book ciphers , Message digest , Digital signatures ,Speech cryptography.

UNIT II   12 Hrs

Hardware & Software security – Hardware security ,Smart card , Biometrics, Virtual Private networks - Types ,Software security .Trusted Operating systems ,KERBEROS.**Database Security** –Issues ,requirements , database security ,Vendor –specific security ,Database Backup ,

Data ware house control & security .**Information security** –Distributed systems security ,Distributed computing environment ,System Vulnerability & abuse , management framework of security & control ,E-commerce security ,E-security Vs E-thieves. **Network security** – Fundamental concepts ,Identification& authentication ,Access control , Model for network security ,malicious software , Firewalls.

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UNIT III   **12 Hrs**
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Wireless network and application ,purpose of WAP ,WAP security **Web Security** – Importance of web security in business ,client/server architecture ,web traffic security approaches , **SSL/TLS for secure web services ,** secure hypertext transfer protocol (S-HTTP) , Secure electronic transaction (SET). **Network security Management** – Goal of network management ,network management model ,simple network management (SNMP). **Security management** - Goals of network security system ,security plan , Secuirty analysis , Change management , Disaster Recovery , Protecting storage media ,Protection of system documentation .

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UNIT IV   **12 Hrs**
</div>

Risk management – What is Risk? Identify the Risk to an organization, Risk analysis ,Incident management ,Incident Response , Incident response process.   **Security & law** – Information Technology Act 2000 , Indian contract act 1872 , Indian Penal code ,Indian copy right act ,Consumer Protection act 1986 . E-mail threats to organization, Email policy, electronic mail security .**Internet Banking system** – steps, layered approaches to security.

Text Book:

Brijendra Singh, Network Security and Management , 3rd edition, PHI Learning Pvt. Ltd.,2011,

Reference Books:

1. Behrouz A. Forouzan , Debdeep Mukhopadhyay, Cryptography and Network Security , 2nd edition, Mcgraw Hill Education, 2011.
2. Charlie Kaufman ,Radia Perlman & Mike Speciner , Network Security -Private Communication in Public World ,2nd edition, PHI Learning.

Group 1

Course -25

Theory : 4

hrs/week

Credits : 2

48 Hours

BCA 353: SOFTWARE TESTING

IA   : 20

Exam :80

Learning Objectives

* To understand the necessity of software testing

* To analyze risks associated with software testing

* To familiarize with different tools available for software testing

Learning Outcome :

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

* Understand the importance of software testing, different testing techniques and use of various test tools

* Create test strategies and plans, design test cases, prioritize and execute them.

* Contribute to efficient delivery of software solutions and implement improvements in the software development processes.

UNIT - I	12 Hrs

Fundamentals of Software testing: Introduction, Historical Perspective of Testing, Definition of Testing, Approaches to Testing, Essentials of Software Testing, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach,   Test Team Efficiency, Challenges in Testing, Test Team Approach, Establishing Testing Policy, Structured Approach to Testing, Defect, Error or Mistake in Software, Testing Process, Test Methodologies/Approaches, Skills Required by Tester. **Software Verification and Validation**: Introduction, Verification, Verification Work Bench, Methods of Verification, Types of Reviews on the Basic Stage/Phase, Reviews in Testing Life Cycle, Coverage in Verification, Validation, Validation Work Bench, Levels of Validation, Acceptance Testing.

UNIT - II   **12 Hrs**

Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Reviews, Unit Testing, Module Testing, Integration Testing, Big Bang Testing, Sandwich Testing, Critical Path First, Subsystem Testing, System Testing, Testing Stages. **Acceptance Testing**: Introduction, Acceptance Testing Criteria, Importance of Acceptance Criteria, Alpha Testing, Beta Testing, Gamma Testing, Acceptance Testing During Each Phase of Software Development, Consideration of Alpha and Beta Acceptance Testing Process, What Does Software Acceptance Enable?, Customer's Responsibilities in Acceptance Testing, Fits for Acceptance Testing, Define Acceptance Criteria, Criticality of Requirements, Factors Affecting Criticality of the Requirements, User Responsibilities in Acceptance Test Plan, Executing Acceptance Plan.

UNIT - III   **12 Hrs**

Special Tests: Introduction, Complexity Testing, Graphical User Interface Testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing and Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Sanity Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Usability Testing, Documentation Testing, Training Testing, Rapid Testing. **Testing Tools**: Introduction, Features of Test Tools, Guidelines for Selecting a Tool, Tools and Skills of Testers, Static Testing Tools, Dynamic Testing Tools, Advantages of Using Tools, Disadvantages of Using Tools, When to Use Automated Test Tools, Testing Using Automated Tools, Difficulties While Introducing New Tools, Process of Procurement of COTS (Readily available tool from Market).

UNIT - IV   **12 Hrs**

Test Planning: Introduction, Test Policy, Test Strategy, Test Planning, Test Plan, Quality Plan and Test Plan, Guidelines for Developing the Test Plan, Test Estimation, Test Standards, Building Test Data and Test Cases, Test Scenario, Test Cases, Essential Activities in Testing, Test Scripts, Test Log Document, Test File, Building Test Data, Generation of Test Data, Tools Used to Build Test Data. **Test Metrics and Test Reports**: Introduction, Testing Related Data, Estimated, Budgeted, Approved and Actual, Test Reports, Test Reports, Integration Test Report, System Test Report, Acceptance Test Report, Guidelines for Writing and Using Report, Final Test Reporting, Test Status Report, Benchmarking

Text Book

3. M G Limaye, Software Testing- Principles, Techniques and Tools, McGraw Hill Education, 2009

Reference Books

1. Ron Patton, Software Testing, Sams Publishing; 2 edition, 2005.
2. SrinivasanDesikan, Gopalaswamy Ramesh, Software Testing- Principles and Practices, Pearson Education India, 2006

Group-I

Course-26

Theory : 4 hrs/week

Credits: 2

48 Hours

BCA 354-E1: PROGRAMMING FOR ANALYTICS

IA   : 20

Exam : 80

Learning Objectives

Learning Objectives: This module introduces Students to various programming languages in the field of Analytics like SQL, SAS, R and form foundation for further analysis of Datasets. Students will learn the basics of these programming languages and learn data manipulation techniques.

Learning Outcome : At the end of the course the students will be able to

- Obtain, clean/process and transform data
- Analyze and interpret data using an ethically responsible approach.
- Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues. Formulate and use appropriate models of data analysis to solve hidden solutions to business-related challenges.

UNIT - I	**12 Hrs**

Introduction to R Programming : R and R Studio, Logical Arguments, Missing Values, Characters, Factors and Numeric, Help in R, Vector to Matrix, Matrix Access, Data Frames, Data Frame Access, Basic Data Manipulation Techniques, Usage of various apply functions – apply, lapply, sapply and tapply, Outliers treatment. **Descriptive Statistics :** Types of Data, Nominal, Ordinal, Scale and Ratio, Measures of Central Tendency, Mean, Mode and Median, Bar Chart, Pie Chart and Box Plot, Measures of Variability, Range, Inter-Quartile-Range, Standard Deviation, Skewness and Kurtosis, Histogram, Stem and Leaf Diagram, Standard Error of Mean and Confidence Intervals.

UNIT - II	**12 Hrs**

Introduction: Database Management Systems: Definition, Characteristics of DBMS, Architecture & Security, Types of Data Models, Concepts and constraints of RDBMS, Introduction to Structured Query Language, MySql Installer, and Download sample Database, Loading Sample Database.

Data definition and Manipulation: SQL Process, SQL Commands – DDL, DML, DCL, DQL, SQL Constraints, Data Integrity, Data Types, SQL Operators, Expressions, Querying Database, Retrieving result sets, Sub Queries, Syntax for various Clauses of SQL, Functions and Joins, Indexes, Views, Transactions.

UNIT - IV   12 Hrs

Basics of SAS : Introduction to SAS, Installation of SAS university Edition, prerequisites for data analysis using SAS, SAS Architecture, Data Types, Formats and Informats, SAS coding-Data step and proc step, Libraries, Importing external data, Reading and Manipulating Data, Functions, Data Transformations, Conditional Statements.

References Books:

1. Dyer, MYSQL in a nutshell. O' Reilly, 2008.
2. DuBois, MySQL cookbook. O' Reilly, 2014
3. Delwiche& Slaughter, SAS: The little SAS Book. SAS Institute, 2012
4. Hemedinger& McDaniel, SAS for dummies. Wiley, 210
5. Madhavan, Mastering Python for Data Science. Packt, 2015
6. McKinney, Python for Data Analysis. O' Reilly,2017
7. Grolemund, R : Hands-on Programming; Garrett, O' Reilly, 2014
8. Paul, R Cookbook. O' Reilly, 2011

Group-I
Course-27
Theory : 4
hrs/week
Credits: 2

48 Hours

BCA 354-E2: MULTIVARIATE DATA ANALYSIS

IA : 20

Exam : 80

Learning Objectives: This course will enable students to exercise Multivariate Techniques in R environment in different Business Cases. They will know the different techniques covered under the scope of Multivariate Analysis and will be able to apply and build select Predictive Models in the context of Binary Classification and Time Series.

Learning Outcome : At the end of the course the students will be able to

- Obtain, clean/process and transform data
- Analyze and interpret data using an ethically responsible approach.
- Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues. Formulate and use appropriate models of data analysis to solve hidden solutions to business-related challenges.

UNIT - I   12 Hrs

Overview of Multivariate Statistics: Nature of Multivariate Analysis, Validity and Reliability, Types of Multivariate Techniques, PCA and Factor Analysis, Multiple Regression, Logistic Regression, Canonical Correlation, Conjoint Analysis, Cluster Analysis, Multi-Dimensional Scaling, Correspondence Analysis, Structural Equation Modeling, Multivariate Model Building.

12 Hrs

UNIT - II

Data Cleaning and Multivariate Techniques: Graphical Examination of Data, Convert Un-Tidy Data into Tidy Data. Missing Data, Imputation of Missing Data by Central Tendency and kNN Method. Outliers, Winsorization of Outliers, Testing the Assumptions of Multivariate Analysis, Incorporating Nonmetric Data with Dummy Variables, Managerial Overview of the Results.

Logistic Regression : Binary Classification versus Point Estimation, Odds versus Probability, Logit Function, Classification Matrix, Individual Group Classification Efficiency, Overall Classification Efficiency, Nagelkerke R Square, Receiver Operating Characteristic Curve, Sensitivity, Specificity, Area Under ROC Curve, Cut-Offs, True Positive Rate and False Positive Rate.

Introduction to Time Series : Nature of Time Series, Components of Time Series, Secular Trend, Seasonal Variations, Cyclical Variations, Irregular Variations, Time Series Decomposition, Smoothing Techniques, Moving Average, Weighted Moving Average, Exponential Smoothing, Double Exponential Smoothing, Regression Trend Analysis, Autocorrelation and Autoregression.

References Books:

1. Hair, J. F. et al.,*Multivariate Data Analysis*, 6th edition. NJ: Prentice Hall,2015

2. Aiken, L. S., & West, S. G,*Multiple Regressions: Testing and Interpreting Interactions*. Newbury Park, CA: Sage,1991.

3. Hamilton, J. D, Time Series Analysis. Princeton University Press,1994

4. Enders, W,*Applied Econometric Time Series*. Hoboken, NJ: John Wiley & Sons,2010

5. Menard, S, *Applied Logistic Regression Analysis*. Thousand Oaks, CA: Sage,2002

6. Tabachnick, B. and Fidell, L,*Using Multivariate Statistics*, New York: Allyn& Bacon,2007.

Group-I		48 Hours
Course-28		
Theory : 4 hrs/week	**BCA 354-E3: BUSINESS STATISTICS WITH R**	**IA : 20**
Credits: 2		**Exam : 80**

Learning Objectives: The objective of this module to make students exercise the fundamentals of statistical analysis in R environment. They would be able to analysis data for the purpose of exploration using descriptive and inferential statistics. Students will understand probability and sampling distributions and learn the creative application of linear regression in multivariate context for predictive purpose.

Learning Outcome : At the end of the course the students will be able to

- Obtain, clean/process and transform data

- Analyze and interpret data using an ethically responsible approach.

- Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues. Formulate and use appropriate models of data analysis to solve hidden solutions to business-related challenges.

UNIT - I	**12 Hrs**

Introduction to R Programming : R and R Studio, Logical Arguments, Missing Values, Characters, Factors and Numeric, Help in R, Vector to Matrix, Matrix Access, Data Frames, Data Frame Access, Basic Data Manipulation Techniques, Usage of various apply functions – apply, lapply, sapply and tapply, Outliers treatment. **Descriptive Statistics :** Types of Data, Nominal, Ordinal, Scale and Ratio, Measures of Central Tendency, Mean, Mode and Median, Bar Chart, Pie Chart and Box Plot, Measures of Variability, Range, Inter-Quartile-Range, Standard Deviation, Skewness and Kurtosis, Histogram, Stem and Leaf Diagram, Standard Error of Mean and Confidence Intervals.

Probability, Probability& Sampling Distribution : Experiment, Sample Space and Events, Classical Probability, General Rules Of Addition, Conditional Probability, General Rules For Multiplication, Independent Events, Bayes' Theorem, Discrete Probability Distributions: Binomial, Poisson, Continuous Probability Distribution, Normal Distribution &t-distribution, Sampling Distribution and Central Limit Theorem.

UNIT - III   **12 Hrs**

Statistical Inference and Hypothesis Testing : Population and Sample, Null and Alternate Hypothesis, Level of Significance, Type I and Type II Errors, One Sample t Test, Confidence Intervals, One Sample Proportion Test, Paired Sample t Test, Independent Samples t Test, Two Sample Proportion Tests, One Way Analysis of Variance and Chi Square Test.

UNIT - IV   **12 Hrs**

Correlation and Regression : Analysis of Relationship, Positive and Negative Correlation, Perfect Correlation, Correlation Matrix, Scatter Plots, Simple Linear Regression, R Square, Adjusted R Square, Testing of Slope, Standard Error of Estimate, Overall Model Fitness, Assumptions of Linear Regression, Multiple Regression, Coefficients of Partial Determination, Durbin Watson Statistics, Variance Inflation Factor.

Reference Books:

1. Grolemund, R : Hands-on Programming; Garrett, O' Reilly,2014.
2. Paul, R: R Cookbook. O' Reilly, 2011.
3. Ken Black, Business Statistics, New Delhi, Wiley, 2013.
4. Anderson, David R., Thomas A. Williams and Dennis J. Sweeney, Statistics for Business and Economics. New Delhi: South Western, 2012.
5. Levin, Richard I. and David S. Rubin, Statistics for Management. New Delhi: Prentice Hall, 1994
6. Waller, Derek, Statistics for Business. London: BH Publications, 2008.
7. Lee, Cheng. et al, Statistics for Business and Financial Economics. New York: Heidelberg Dordrecht 2013.

Group-I
Course-29

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BCA 354-E4: LAMP TECHNOLOGY   **48 hours**

</div>

Theory/Week: 4 Hrs

                I A: 20

Exam: 80

Credits: 2

Learning Objectives

* To understand the importance of LAMP Technology to build Web based application to assess data. models

* To acquire skills on web based application in Both Linux and Windows environment.

Learning Outcome : At the end of the course the students will be able to

* Design web bases application on client server technology

* Analyze and interpret data using an ethically responsible approach.

* Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues.

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UNIT-I   **12 Hrs.**

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Linux Operating System: Linux Operating System Concepts and Architecture; Overview of the Linux Kernel, User Space, Kernel Space; Processes and Daemons, Process Control; Overview of Linux Administration; Linux File system, User, Group and Resource Management; Configuration Files Overview; File system Permissions, Access Permissions and Security, Common Filesystem Commands, Recursion Option in Commands, Find, Grep, Cat, More, Less and Sort Commands.

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UNIT-II   **12 Hrs.**

</div>

Apache Web Server: Linux distribution Apache Installation; Starting and stopping Web Server Apache Configuration files; Apache Directives – Server Configuration, Directory level configuration: htaccess and <Directory>, Access Control, URL Pathnames, MIME types, CGI files, Automatic directory Indexing, Authentication, Log files; Virtual Hosting – IP Address Virtual Host, Name Based Virtual Host, Dynamic Virtual Hosting; Server Side includes; Apache GUI Configuration Tools ậ Comanche and linuxconf; Web Server Security –SSL; Apache Web Server Configuration files.

HTML/XHTML and HTTP: basics review, PHP and the web server Architecture model, Overview of PHP capabilities, CGI vs. Shared Object Model, PHP HTML Embedding Tags and Syntax, simple PHP script example; PHP and HTTP environment variables. MYSQL Database Server: Installation- precompiled packages, post installed configuration, post installed troubleshooting; MySQL Administration; Commands – myisamchk, mysql, mysqladmin, mysqlbug, mysqlimport, mysqlshow; Creating users and granting them permissions; Creating databases; Data types; Creating a table; Graphical tools. PHP: Obtaining, Installing and configuring PHP; obtaining PHP Source code; Installing PHP from Binary Packages; PHP and security considerations; PHP configuration parameters and the php.ini File; Language Options, Register Globals and Security Resource limits parameters, Error Handling and Logging parameters; Data handling parameters, Paths and Directories, Dynamic Extensions, Checking install with phpinfo function.

PHP Language core: Variables, Constants and Datatypes, and Operators; Decision making, Flow control and loops; Arrays and Array operations, Two dimensional and multidimensional arrays, Strings and strings operations; Functions, Function Declaration and parameter passing; Outputting data, include and require statements; file and Directory Access Operation; Error Handling and Reporting Considerations; Processing HTML From Input from the User ; Creating a Dynamic HTML Form with PHP; Login and Authenticating Users; Using GET, POST, SESSION and COOKIES variable; Session management and Variables; Working with Cookies, Sending Emails; Object Oriented PHP: Classes and Constructors. **Database Operation With PHP:** Built-in Database Function ,Connecting to a MySQl Database; Selecting a Database, Building and Sending the Query to Database; Engine, Retrieving Result â¢€ Retrieving, Updating and Inserting Data; Sample Database Routines and Code Segments, Logging Database; Operations for Troubleshooting .

Text books:

1. Lee , Open Source Development with LAMP : Using Linux, Apache, MySQL, Perl and PHP, Pearson Education, 2006

2. Timothy Boronczyk, et al, Beginning PHP6, Apache, MySQL Web Development, Wiley India Pvt Ltd, 2009

3. Julie C Meloni, Teach Yourself PHP, MySQL and Apache All-in-One, SAMS, 2008

Reference Books:

1. W. Jason Gilmore, Beginning PHP and MySQL: From Novice to Professional, 4th Edition, Apress, 2010

2. AleksaVukotic, James Goodwill, Apache Tomcat 7, Apress, 2011

3. Richard Petersen, Linux Complete Reference, 6th Edition, Tata McGraw Hill Education Private Limited

Group-I Course-30		Credits : 10
Group-I **Course-30**	**BCA 355: PROJECT WORK**	**Credits : 10**
Theory : 4 hrs/week **Credits: 2**		**IA : 100** **Exam : 400**

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PROJECT GUIDELINES

</div>

Preamble: Project work has been made a part of BCA course to give students exposure to Software development exercises. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices. As such, during the development of the project students shall involve themselves in all the stages of the software development life cycle (SDLC) like requirements analysis, systems design, software development/coding, testing and documentation, with an overall emphasis on the development of reliable software systems. Since, the project work spans over the entire final semester, the students shall be advised to take up projects for solving problems of software industry or any research organization or the real life problems suggested by the faculty in-charge of BCA project work in the Institutions. Topic chosen of work must be nontrivial, analytical and application-oriented. It must involve substantial original work and/or development effort based on the theme. Solved, off-the-shelf and pirated work is not entertained. Any attempt of plagiarism or use of unfair means will result in rejection of the work. All activities of the Project Development must be time-bound and the equal participation of the team members expected throughout the Development process.

GENERAL GUIDELINES TO THE INSTITUTIONS

- Calendar of Project Work shall be announced before the commencement of the Sixth semester. Calendar should contain tentative schedules for the submission of Project Proposal, Project Acceptance, Project Synopsis, Problem Analysis Document, System Design Document, Database Design, Detailed Design, Coding and Testing, Final Report, Internal Assessment exams (at least two), Viva/Voce etc.

- Students shall undertake projects with real life problems (that has direct relevance in day-to-day activities or to knowledge extension) either in their Colleges or in industry/research and development laboratories/software companies as recommended by the faculty in-charge of BCA project work in the Institutions. If a student intends

to do industry project, the faculty in-charge shall ensure that the projects are genuine and original in nature.

- There shall be not more than three members in a Project team.

- At least two internal assessment exams shall be conducted to evaluate the progress made by the students at different stages of project work. Such exams may include written tests, document verification and presentations, work demonstration, group discussion, viva-voce etc. so as to objectively assess the understanding gained by the students in course of their project work.

PROJECT VALUATION

External and Internal Examiners together conduct project valuation objectively. To begin with, the finer details about various points contained in the scheme of valuation may be conclusively agreed upon through mutual consultation. During project evaluation, a student shall present his/her work through live demonstration of the software application developed as a part of project. However, if live demonstration is not possible due to the reason that some companies do not divulge source code on account of ownership rights or copyrights, students may be allowed to make PPT presentation of their authentic works. In such cases, candidates shall produce necessary declarations issued by the companies to this effect. However, students shall be enabled to present their work in entirety. The primary objective of project evaluation shall be to assess the extent of effort that was put in to meet the objectives of the project and also to gauge the understanding gained by the students in course of their project works. While evaluating Project Reports, examiners shall scrutinize whether Software Development Life Cycle (SDLC) principles have been consistently followed in the project work and the same are documented well in the Reports. However, the relative and overall emphasis of these principles to a particular problem domain chosen may be taken into account so that project evaluations remain fair and objective.

SCHEME OF VALUATION and Marks Distribution

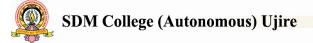|		Particulars	Marks
Internal Assessment			
		Progress assessment for Four Times @ 25 marks at each time	**100**
Project Report Valuation : 300 marks			
1		Innovativeness and utility of the project for Industry/Academic or Society (Utility)	25
2		Related studies about the project (Adequacy)	20
3		Project plan & implementation - target achieved / output delivered (effectiveness)	
	3.1	Problem Analysis	40
	3.2	System Design	40
	3.3	Database Design	40
	3.4	Detailed Design	40
	3.5	Implementation	40
	3.6	Testing	40
4		Other mandatory documents & information (certificates, contents, tables, figures, bibliography etc.)	15
Viva-Voce : 100 marks			
1		Live Demonstration (Software execution) or Dry runs (Presentation of authentic screenshots or captured videos may be used to walk through complete scenarios) - consistency and completeness	60
2		Question and Answer (Oral only or Oral and written)	40
Total Marks			400

FORMAT OF PROJECT SYNOPSIS

Synopsis is a brief outline or general view, as of a subject or written work; an abstract or a summary of the Project Work. It must be as brief (NOT MORE THAN 20 A4 sized paper pages) as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up.

The write up must adhere to the guidelines and should include the following :

1. Title of the Project.
2. Introduction, objectives and scope of the Project.
3. Project Category (Database/Web Application/ Client-server/Networking/ Multimedia/gaming etc.).
4. Tools / Platform, Hardware and Software Requirement specifications.
5. Analysis (DFDs at least up to second level, ER Diagrams/ Class Diagrams, Database Design etc. as per the project requirements).
6. A complete structure which includes: Number of modules and their description to provide an estimation of the student's effort on the project, Data Structures as per the project requirements for all the modules, Process logic of each module, testing process to be used, reports generation (Mention tentative content of report).
7. Whether Industry Defined/Client Defined/User Defined Project? Mention the type. Mention the Name and Address of the Industry/Client.
8. Limitation of the project.
9. Future scope and further enhancement of the project.

GUIDELINES FOR PREPARATION OF DISSERTATION

1. ORGANISATION OF THE DISSERTATION

The dissertation shall be presented in a number of *chapters, starting* with **Introduction** and ending with **Conclusion.** Each of the chapters will have precise title reflecting the contents of the chapter. A chapter can be subdivided into *sections, sub- sections and sub-sub-section* so as to present the content discretely and with due emphasis.
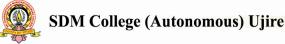
Sequence of items in Dissertation Report

The following sequence may be followed in the preparation of the final dissertation report:

- Cover Page (On the **hardbound** cover)

- Title Page (Inner Cover Page)

- Certificate from the Institute

- Certificate from the Company

- Declaration

- Acknowledgement

- (Detailed) Table of Contents (with page numbers).

- List of Figures (with figure number, figure titles and page numbers)

- List of Tables with table number, table title and page number.

- Chapters

    1. **Introduction**

        i. Introduction of the System

            a. Project Title

            b. Category

            c. Overview

        ii. Background

            a. Introduction of the Company

            b. Brief note on Existing System

        iii. Objectives of the System

        iv. Scope of the System

        v. Structure of the System

        vi. System Architecture

        vii. End Users

        viii. Software/Hardware used for the development

        ix. Software/Hardware required for the implementation

2. **SRS**
   i. Introduction (Brief write-up about SRS)
   ii. Overall Description
      a. Product perspective
      b. Product Functions
      c. User characteristics
      d. General constraints
      e. Assumptions
   iii. Special Requirements (Software / Hardware - if any)
   iv. Functional requirements
      a. Module 1
      b. Module 2
      c. ….
   v. Design Constraints
   vi. System Attributes
   vii. Other Requirements (if any)

3. **System Design** (Functional Design)
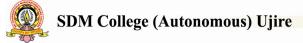   i. Introduction (brief write-up about System Design)
   ii. Assumptions and Constraints
   iii. Functional decomposition
      a. System software architecture
      b. System technical architecture
      c. System hardware architecture
      d. External interfaces (if any)
   iv. Description of Programs
      a. Context Flow Diagram (CFD)
      b. Data Flow Diagrams (DFDs – Level 0, Level 1, Level 2)

     v. Description of components

         a. Functional component 1

         b. Functional component 2

         c. ….

4. **Database Design** (or Data structure)

     i. Introduction (brief write-up about Database design)

     ii. Purpose and scope

     iii. Database Identification

     iv. Schema information

     v. Table Definition

     vi. Physical design

     vii. Data Dictionary

     viii. ER diagram

     ix. Database Administration

         a. System information

         b. DBMS configuration

         c. Support software required

         d. Storage requirements

         e. Backup and recovery

5. **Detailed Design** (Logic design of modules)

     i. Introduction (brief write-up about Database design)

     ii. Structure of the software package (structure chart)

     iii. Modular decomposition of the System

         a. Module1

            a. Inputs

            b. Procedural details

            c. File I/O interfaces

            d. Outputs

            e. Implementation aspects (if any)

b. Module 2

1. …..

6. **Program code listing**

    i. Database connection

    ii. Authorization / Authentication

    iii. Data store / retrieval / update

    iv. Data validation

    v. Search

    vi. Named procedures / functions

    vii. Interfacing with external devices (if any)

    viii. Passing of parameters

    ix. Backup/recovery

    x. Internal documentation

    xi. ……

7. **User Interface** (Screens and Reports)

    i. Login

    ii. Main Screen / Home page

    iii. Menu

    iv. Data store / retrieval / update

    v. Validation

    vi. View

    vii. On screen reports

    viii. Data Reports

    ix. Alerts

    x. Error messages

    xi. ……..

8. **Testing**
    i. Introduction (brief write-up about Software Testing)
    ii. Test Reports
        a. Unit Testing
        b. Integrate Testing
        c. System Testing
- Conclusion
- Limitations
- Scope for enhancement (future scope)
- Abbreviations and Acronyms (list)
- Bibliography / References (list in specified format)

Do not include any header or footer in any page of the report. Only page numbers should be mentioned at the bottom center of each page. 'n' copies of dissertation along with soft copy in CD should be prepared by the candidate.

2. DISSERTATION FORMAT

2.1 Paper
2.1.1 Quality

The dissertation shall be printed on white bond paper, whiteness 95% or above, weight 70 gram or more per square meter.

2.1.2 Size

The size of the paper shall be standard A4; height 297 mm, width 210 mm.

2.1.3 Type-Setting, Text Processing and Printing

The text shall be printed employing Laserjet or Inkjet printer, the text having been processed using a standard text processor. The standard font shall be Times New Roman of 12 pts with 1.5 line spacing.

2.1.4 Page Format

The printed sheets shall have the following writing area and margins:

Top margin   .5"
Bottom margin   .5"
Left margin   1"
Right margin   .75"

2.1.5 Pagination

Page numbering in the text of the dissertation shall be numerals starting from **'1' at the center of the footer**. The text of the written dissertation shall not be *less than 60 pages excluding references, tables, questionnaires and other annexure.*

Pagination for pages before the Introduction chapter shall be in lower case Roman numerals, e.g., 'iv'.

2.1.6 Paragraph format

Vertical space between paragraphs shall be about 2.5 line spacing.

The first line of each paragraph should normally be indented by five characters or 12 mm. Acandidate may, however, choose not to indent if (s) he has provided sufficient paragraph separation.

A paragraph should normally comprise more than one line. A single line of a paragraph shall not be left at the top or bottom of a page (that is, no windows or orphans should be left).

The word at the right end of the first line of a page or paragraph should, as far as possible, not be hyphenated.

2.2 Chapter and Section format

2.2.1 Chapter

Each chapter shall begin on a fresh page with an additional top margin of about 75 mm. Chapter number (in Hindu- Arabic) and title shall be printed at the center of the line in 6 mm font size (18 pt) in bold face using both upper and lower case (all capitals or small capitals shall not be used). A vertical gap of about 25 mm shall be left between the chapter number and chapter title lines and between chapter title line and the first paragraph.

2.2.2 Sections and Sub- sections

A chapter can be divided into **Sections, Sub-sections and Sub-sub-sections** so as to present different concepts separately. Sections and sub-sections can be numbered using decimal points, e.g., 2.2 for the second Section in Chapter 2 and 2.3.4 for the fourth Sub-section in third Section of Chapter 2. Chapters, Sections and Sub-Sections shall be included in the ***Contents*** with page numbers flushed to the right. Further subsections need not be numbered or included in the contents. The Sections and Sub-sections titles along with their numbers in 5 and 4mm (16 and 14 pt) fonts, respectively, in bold face shall be flushed to the left (not centered) with 15 mm space above and below these lines. In further subdivisions character size of 3 and 3.5 with bold face, small caps, all caps and italics may be sued for the titles flushed left or centered. These shall not feature in the contents.

2.2.3 Table / Figure Format

As far as possible tables and figures should be presented in portrait style. Small size table and figures (less than half of writing area of a page) should be incorporated within the text, while larger ones may be presented in separate pages. Table and figures shall be numbered chapter-wise. For example, the fourth figure in Chapter 5 will bear the number **Figure 5.4** or *Fig.5.4*

Table number and title will be placed above the table while the figure number and caption will be located below the figure. Reference for Table and Figures reproduced from elsewhere shall be cited in the last and separate line in the table and figure caption, e.g. (after McGregor [12]).

3 AUXILIARY FORMAT

3.1 Binding
The dissertation shall be hard cover bound in leather or rexin.

3.2 Front Covers

The front cover shall contain the following details:
- Full title of dissertation in 6 mm 22 point size font properly centered and positioned at the top.
- Full name of the candidate in 4.5 mm 15 point size font properly centered at the middle of the page.
- A 40 mm dia replica of the college emblem followed by the name of the Department and the year of submission, each in a separate line and properly centered and located at the bottom of the page.

3.2.1 Lettering

All lettering shall be embossed in gold.

3.2.2 Bound back

The degree, the name of the candidate and the year of submission shall also be embossed on the bound (side) in gold.

3.3 Blank sheets

In addition to the white sheets (binding requirement) two white shall be put at the beginning and end of the dissertation.

3.4 Title sheet

This shall be the first printed page of the dissertation and shall contain the submission statement: the Dissertation submitted in partial fulfillment of the requirements of the BCA, the name and Roll No. Of the candidate, name (s) of the supervisor and co-supervisor (s) (if any), Department and year of submission.