



**Mount Carmel College Autonomous  
Bengaluru**

*Affiliated to Bengaluru Central University*

**Department of Computer Science**

**BCA Programme**

**CBCS SYLLABUS**

**2019 Batch Onwards**

## **The Syllabus for the BCA Course for the I - VI Semesters from the academic year 2019-2020.**

### **Abstract**

Mount Carmel College offers various Under Graduate courses in the Science discipline and Application areas. The under graduate programme span through three academic years with six semesters of four months duration each. BCA programme is designed to provide an insight into computing through fundamental concepts, principles, strategies and skills supplemented with practical exposure to effectively apply in real-time computing environments.

The first four semesters have one English and one Language in Part I, three core courses and two lab-oriented papers in Part II, one Additional Course such as *Ability Enhancement /Interdisciplinary/ Skill Enhancement Course* and Value education in Part III. The V and VI semesters have core courses, elective courses, and lab-oriented papers with a mini project and Value Education. Electives are offered in the fifth and sixth semesters to streamline the students based on their area of interest. The project emphasize on complete understanding, analyzing, designing, developing, maintaining primarily business, information systems and on recent trends in computing.

During the first four semesters, the focus is on fundamental principles and concepts in computing by providing Mathematical foundation, Basics of Statistics, Accounting, Business communication, Digital principles, Problem solving techniques and algorithmic processes to understand, create, test and transform information. In the next two semesters the focus is on engineering considerations, system design, development and applications.

All the papers are assessed through Continuous Internal Assessment and End Semester Examination.

### **Program Outcomes:**

**PO1:** Gain theoretical and practical knowledge in the core and allied areas of Computer Science and apply them in developing solutions to the problems.

**PO2:** Develop language skills for effective oral and technical communication in business environment.

**PO3:** Explore hardware, operating systems, open source software, application packages and other resources in order to use it effectively to design, develop and deploy applications

**PO4:** Inculcate the ability of problem solving, life-long learning and work in teams effectively in the societal context

**PO5:** Identify, select, formulate and apply appropriate techniques, use relevant resources and design optimal solutions to real-time problems.

**PO6:** Equip with moral values and professional ethics to take-up responsibilities and reach out to the societal needs.

## **Regulations Pertaining to Bachelor of Computer Applications ( BCA )**

- 1. Eligibility :**Students who have completed two years Pre-University (10+2) Course of Karnataka or equivalent examination are eligible to apply for admission to BCA Degree Programme.
- 2. Duration of the Course:** Three academic years consisting of six semesters.
- 3. Medium of Instruction:** The medium of Instruction and Examination shall be in English.
- 4. Evaluation Procedure for courses with practicals:**

**a) Continuous Internal Assessment for theory ( CIA ) : 30 Marks**

One test	15
Assignments / Projects / GK & Quiz / Presentations	10
Attendance	5
Total	30

**b) End Semester Examination for theory( ESE ) : 70 Marks**

**c) Continuous Internal Assessment for Practicals( CIA ) : 15 Marks**

Pre-final test	10
Attendance	5
Total	15

**d) End Semester Examination for Practicals( ESE ) : 35 Marks**

**e) Students should secure a paper minimum of 40% each in end semester theory and in theory total (CIA + ESE), end semester practical examination and in practical total (CIA + ESE).**

**5. Evaluation Procedure for courses without Practicals:**

**a) Continuous Internal Assessment for theory ( CIA ) : 50 Marks**

One test	30
Assignments / Projects / GK & Quiz / Presentations	15
Attendance	5
Total	50

**b) End Semester Examination for theory (ESE) : 100 Marks**

**c) Students should secure a paper minimum of 40% each in end semester theory and in theory Total (CIA + ESE),**

**6. Evaluation Procedure for core Projects I & II**

**V Semester Project I :**

**a) Continuous Internal Assessment ( CIA ) : 30 Marks**

Review - I	10
Pre-final Test	15
Attendance	5
Total	30

**b) End Semester Examination (ESE) : 70 Marks**

**c) Students should secure a paper minimum of 40% in end semester examination and in total (CIA+ ESE).**

**VI Semester Project II:**

**a) Continuous Internal Assessment ( CIA ) : 50 Marks**

Review - I	20
Pre-final Test	25
Attendance	5
Total	50

**b) End Semester Examination (ESE) : 150 Marks**

**c) Students should secure a paper minimum of 40% in end semester examination and in total (CIA+ ESE).**

**BCA - Framework**

Semester	Part	Subject Code	Paper Title	Hrs /Wk	Marks			Credits		
					CIA	ESE	Total	Subject	Semester	
I	Part - 1 Language	CA1LA	Language-I	4	30	70	100	2	22	
		CA1BE	Business English and Communication - I	4	30	70	100	2		
	Part - 2 Core Course	CA1MFCA	Mathematical Foundation For Computer Applications - I	5	50	100	150	5		
		CA1DALP	Digital Electronics and Microprocessor	4	30	70	100	4		
		CA1CPP	Computer Programming and Problem Solving	4	30	70	100	4		
		Practicals								
		CA1DALPL	Digital Electronics & Assembly Language Programming Lab	3	15	35	50	1.5		
	CA1CPL	' C ' Programming Lab	3	15	35	50	1.5			
	Part - 3 Additional Course	Ability Enhancement Course - (AEC) ** Environmental Studies & Public Health/ Indian Constitution		2	15	35	50	2		
Value Education		-	-	-	-	-				

Semester	Part	Subject Code	Paper Title	Hrs /Wk	Marks			Credits		
					CIA	ESE	Total	Subject	Semester	
II	Part - 1 Language	CA2LA	Language-II	4	30	70	100	2	22	
		CA2BE	Business English and Communication - II	4	30	70	100	2		
	Part - 2 Core Course	CA2MFCA	Mathematical Foundation For Computer Applications - II	5	50	100	150	5		
		CA2DS	Data Structures	4	30	70	100	4		
		CA2DMS	Database Management Systems	4	30	70	100	4		
		Practicals								
		CA2DSL	Data Structures Lab	3	15	35	50	1.5		
	CA2DBSL	Database Management Systems Lab	3	15	35	50	1.5			
	Part - 3 Additional Course	Ability Enhancement Course - (AEC) ** Environmental Studies & Public Health/ Indian Constitution		2	15	35	50	2		
Value Education		-	-	-	-	-				

Bachelor of Computer Applications (BCA) (CBCS) Syllabus: 2019 Batch Onwards

Sem ester	Part	Subject Code	Paper Title	Hrs /Wk	Marks			Credits		
					CIA	ESE	Total	Subject	Semester	
III	Part - 1 Language	CA3LA	Language-III	4	30	70	100	2	22	
		CA3BE	Business English and Communication- III	4	30	70	100	2		
	Part - 2 Core Course	CA3SMCA	Statistical Methods for Computer Applications	5	50	100	150	5		
		CA3OOPJ	Object Oriented Programming Using Java	4	30	70	100	4		
		CA3OS	Operating System	4	30	70	100	4		
		<b>Practicals</b>								
		CA3JPL	Java Programming Lab	3	15	35	50	1.5		
		CA3VPL	Visual Programming Lab	3	15	35	50	1.5		
	Part – 3 Interdisciplinary Course		Generic Course – GC ** Multimedia Authoring Tools		2	15	35	50		2

Sem ester	Part	Subject Code	Paper Title	Hrs /Wk	Marks			Credits		
					CIA	ESE	Total	Subject	Semester	
IV	Part - 1 Language	CA4LA	Language-IV	4	30	70	100	2	22	
		CA4BE	Business English and Communication - IV	4	30	70	100	2		
	Part - 2 Core Course	CA4AFM	Accounting & Financial Management	5	50	100	150	5		
		CA4WP	Web Programming	4	30	70	100	4		
		CA4UP	Unix Programming	4	30	70	100	4		
		<b>Practicals</b>								
		CA4WPL	Web Programming Lab	3	15	35	50	1.5		
		CA4UPL	Unix Programming Lab	3	15	35	50	1.5		
	Part - 3 Skill Enhancement Course		** Python Programming		2	15	35	50		2

Bachelor of Computer Applications (BCA) (CBCS) Syllabus: 2019 Batch Onwards

Semester	Part	Subject Code	Paper Title	Hrs /Wk	Marks			Credits		
					CIA	ESE	Total	Subject	Semester	
V	Part - 1 Core Course	CA5CN	Computer Networks	4	50	100	150	4	27	
		CA5SE	Software Engineering	4	50	100	150	4		
		CA5AJP	Advanced Java Programming	4	30	70	100	4		
		CA5MAD	Mobile Application Development	4	30	70	100	4		
		<b>Elective - I</b>								
		CA5CA	Computer Architecture	4	50	100	150	4		
		CA5FAFL	Finite Automata and Formal Languages							
		CA5AI	Artificial Intelligence							
		<b>Practicals</b>								
		CA5AJPL	Advanced Java Programming Lab	3	15	35	50	1.5		
		CA5MADL	Mobile Application Development Lab	3	15	35	50	1.5		
		CA5PR1	Project -I	8	30	70	100	4		
	<b>Part - 2 Additional Course</b>		Value Education	-	-	-	-	-		

Semester	Part	Subject Code	Paper Title	Hrs /Wk	Marks			Credits		
					CIA	ESE	Total	Subject	Semester	
VI	Part - 1 Core Course	CA6DWDM	Data warehousing and Data mining	4	50	100	150	4	25	
		CA6DAA	Design and Analysis of Algorithms	4	50	100	150	4		
		CA6MA	Multimedia Applications	4	30	70	100	4		
		<b>Elective - II</b>								
		CA6EC	e-Commerce	4	50	100	150	4		
		CA6NS	Network Security							
		CA6CC	Cloud Computing							
		<b>Practicals</b>								
		CA6DAL	Data Mining and Analytics Lab	3	15	35	50	1.5		
		CA6MAL	Multimedia Applications Lab	3	15	35	50	1.5		
	CA6PR2	Project - II	12	50	150	200	6			
<b>Part - 2 Additional Course</b>		Value Education	-	-	-	-	-			

CIA - Continuous Internal Assessment

ESE - End Semester Examination

Total Credits: 140

## **FIRST SEMESTER**

### **CA1BE: Business English and Communication – I**

**52 Hours Course**

**Theory - 4 Hours /week**

***Objectives: To adopt global standards of communication that would span diverse job functions. Skill students in all possible areas of specialization. Train students to be ‘near industry ready’ by the time they graduate from college. Impart language acquisition more than language learning.***

***The main thrust of the course content is clearly controlled by the demands and constraints of the Business world. All modules are specifically designed to make learners attain communicative competence through learner generated activities.***

<b>Business English and Communication - I</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Comprehension</b>	Guidelines for Comprehension	<b>10</b>
<b>II Interpreting Texts</b>	a) Essay b) Poem c) Short Story	<b>10</b>
<b>III The Nature of Communication</b>	Methods of Communication, Means of Communication, Communication Systems, Principles of Effective Communication, Oral Communication-Speaking Skills, Listening Skills, Non-verbal Communication	<b>10</b>
<b>IV Persuasive Communication</b>	Categories of Business Letters	<b>12</b>
<b>V Use of English</b>	Business Language, Parts of Speech, Subject and Verb Agreement, Punctuation. (Surveys, Questionnaires, Brochures: Project/Assignment)	<b>10</b>

#### **Assessment**

- Teachers are constantly assessing students informally in class, through observation, listening and discussion with students. Self, peer and group assessment are used, as well as more formal teacher assessment.
- Students are assessed during the year on their written assignments, oral presentations and annual skills. They are also assessed on their ability to work both collaboratively and independently.

#### **Resources**

The Department does not follow a set text book but makes use of the large range of resources available in the library



**CA1MFCA: Mathematical Foundation for Computer Applications – I**

65Hours Course

Theory - 5 Hours /week

*Objective: To understand & apply the fundamental concepts and tools in discrete Mathematics to Computer Applications*

*Prerequisites: Basic knowledge in Mathematics*

<b>Mathematical Foundation For Computer Applications - I</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Set, Relations and Functions</b>	Sets-Set operations, Cartesian products –Relations-Equivalence Relation-Partition-Partial Order Relation-Functions, Inverse functions, Composite functions-Properties of functions.	<b>12</b>
<b>II Mathematical Logic</b>	Propositions – Logical connectives and truth tables – Tautology – contradiction – logical equivalence and laws of logic –Standard Theorems, Problems on negation, Converse, inverse and Contra positive of a Proposition, Open Sentences, Quantifiers, Truth sets, Connectives involving quantifiers, Normal forms, Principal normal forms.	<b>13</b>
<b>III Groups</b>	Binary operations - Definition of Group, Subgroup, Results on subgroups, Cyclic groups, Order of an element, Coset decomposition, Lagrange’s theorem and its consequences, Group homomorphism.	<b>13</b>
<b>IV Matrix Theory</b>	Review of fundamentals, Equivalent matrices, Elementary row (column) operations, Rank of a Matrix by reducing it to echelon form, Rank of a matrix by normal form, Finding the inverse of a Matrix	<b>13</b>
<b>V Linear Algebra</b>	Homogeneous and non – Homogeneous system of m linear equations in n unknowns - Consistency criterion, Characteristic equations – Eigen values, Eigen vectors and properties, Cayley Hamilton theorem	<b>14</b>

**Text Books**

1. D.S.Chandrasekharaiah-“ Discrete Mathematical Structures”, PRISM Book Pvt Ltd., Second Edition, 2009.
2. A R Vasishta-“ Matrices”, S K Rastogifor Krishna Prakashan Media(P) Ltd.,Eighteenth Edition, 2008.
3. P.R. Vittal-“ Mathematical Foundations”, MarghamPublications,Second Edition, 2003

**CA1DALP : Digital Electronics and Microprocessor**

**52 Hours Course**

**Theory –4 Hours /week**

**Objective : To impart basic knowledge in design of digital circuits and microprocessor.**

**Prerequisites: Basic awareness in Computers.**

<b>Digital Electronics and Microprocessor</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Number Systems</b>	Binary, Octal, Decimal and Hexadecimal Number System and their Inter Conversion. <b>Binary Codes:</b> BCD, Excess3, Parity, Gray, ASCII and Their Advantages and Disadvantages. <b>Data Representation:</b> Positive, and Negative Numbers, IEEE 754 Floating point representation. <b>Binary Arithmetic:</b> Binary Addition, Decimal Subtraction , Binary Subtraction Using radix and radix -1 Compliment. <b>Logic Gates:</b> Truth Table, Properties and Symbolic Representation of NOT, AND, OR, NOR, NAND, EX-OR, Ex-NOR Gates. NOR and NAND Gates as a Universal Gates.	<b>12</b>
<b>II Boolean Algebra &amp; Combinational Circuits</b>	Laws and Identities of Boolean Algebra, Demorgan’s Theorem, Use of Boolean Algebra for Simplification of Logic Expression, K-Map for 2, 3, 4 Variables, Simplification of SOP and POS Logic Expression Using K-Map. Combinational Circuits: Half Adder, Full Adder, Half Subtractor, Multiplexer(2:1,4:1), Demultiplexer(1:2,1:4), Decoder(BCD to decimal), Encoder(Decimal to BCD)	<b>7</b>
<b>III Sequential Circuits&amp; Counters</b>	Flip Flops: Working of RSFF, DFF, TFF, JKFF, and MSFF. Counters: Working of Asynchronous(3 bit and 4 bit), Synchronous (3 bit and 4 bit-no design), Shift Registers and Their Types, Ring Counter, Johnson Counter with Their Timing Diagram.	<b>7</b>
<b>IV 8086 Microprocessor</b>	Architecture of 8086, Pin Diagram of 8086, Addressing Modes Instruction Set: Data Transfer, Arithmetic, Logical, String Manipulation, Control Transfer, Unconditional Branch, Conditional Branch, Flag, and Processor Control, Interrupts.	<b>14</b>
<b>V Assembly language Programming</b>	Assembly Language Programs- 8/16bit addition, 8/16bit subtraction, 8/16bit multiplication, sorting an array in ascending and descending order, Assembly Directives and Operators .	<b>12</b>

**Text Books**

1. Malvino and Leach –“Digital Principles and Applications”, Fifth Edition 2005.
2. Liu Gibson,” Microcomputer System: the 8086/8088 family”, PHI, Second Edition 1997.

**Reference Books**

1. Floyd –“Digital Fundamentals”, Third Edition 1993.
2. B. Ram-“Fundamentals of Microprocessors and Microcomputers”,DhanpatRai publications, FifthEdition 2001.
3. A.K.Ray and K.M. Bhurchundi-”Advanced Microprocessor and Peripherals”, Tata McGraw Hill,Third Edition 2013.

**CA1CPP : Computer Programming and Problem Solving**

**52 Hours Course**

**Theory - 4 Hours /week**

**Objective: To understand problem solving Techniques and gain Computer Programming skills.**

**Prerequisites: Analytical and Logical skills.**

**CO1:** Understanding the basic components of a computer and the functioning of each component

**CO2:** Understand various problem solving techniques and design efficient algorithms to solve a given problem

**CO3:** Comprehend the basic elements and the control structures of C programming and apply it to solve problems

**CO4:** Write C programs, edit, compile and debug the programs

**CO5:** Understand arrays, structure, union and pointers and apply them to improve program efficiency

**CO6:** Implement file operations to design data oriented applications

<b>Computer Programming and Problem Solving</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Introduction to Computers</b>	<b>Understanding Computers :</b> Evolution of Computers. Generation of Computers, Classification of Computers- Analog. Digital and Hybrid Computers. Classification of Computers according to size- Super Computers. Mainframe Computers, Personal Computers (Different Types). Characteristics of Computers. Block Diagram of a Digital Computer.	<b>5</b>
<b>II</b> <b>Principles of Programming</b>	<b>Problem solving using computers : An algorithmic approach</b> Problem analysis – Top-down approach, stepwise refinement. Problem design/solution – algorithms, characteristics, flowcharts, pseudo code, implementation. <b>Analysis of algorithms:</b> Time & Space complexities - best case, average case and worst case considerations. Design of algorithms – Iterative, Recursive & Divide and Conquer. <b>Recursive&amp; Iterative algorithms, Search &amp;Sorting algorithms.</b>	<b>10</b>
<b>III</b> <b>‘C’ Language Fundamentals</b>	<b>‘C’ Language Fundamentals:</b> Character set, constants, variables, expressions, keywords, data types, declaration, statements- types of statements -arithmetic, assignment, control, I/O statements, Operators in ‘C’, Hierarchy of operators.	<b>12</b>

	<p><b>‘C’ Program Constructs:</b> Sequential, selective, repetitive controls. Multiway selection, break, continue, exit statements.</p> <p><b>Functions:</b> Function definition, types of functions- built-in, user-defined, passing values between functions (call by value), Adding functions to the Library.</p> <p>Storage Classes.</p> <p><b>String functions :</b> strlen, strcat, strcpy, strrev, strcmp and its variations.</p> <p><b>Arrays :</b> Concepts, declaration, initialization, 1-D, 2-D arrays, passing arrays between functions. Multi-dimensional arrays.</p>	
<p><b>IV</b></p> <p><b>Functions , Arrays Pointers, Structure&amp; Union</b></p>	<p><b>Pointers:</b> Concept of pointers, address operator, pointer operator, pointer expression, pointer arithmetic, Pointers and functions – call by reference.</p> <p><b>Structure:</b> Declaration, initializing a structure, accessing structure elements, structure storage, array of structures, arrays within a structure, additional features and uses of structures, functions and structures, nested structures, pointers and structures.</p> <p><b>Union:</b> Union and bit fields, declarations, comparison between unions and structures typedef and sizeof operator &amp; enumeration. Operations on Bits: Bitwise operators.</p>	<p><b>15</b></p>
<p><b>V</b></p> <p><b>Preprocessor &amp; Input/Output</b></p>	<p><b>Pre processor directives :</b> Features, macros, file inclusion, conditional compilation</p> <p><b>Input/output:</b> Types (Console &amp; File), formatted &amp; Un formatted, types of files, file operations-opening and closing a data file, creating and accessing a data file.</p>	<p><b>10</b></p>

**Text Books**

1. R.G. Dromey – “How to solve it by Computer”- PHI, 2008.
2. Yashavant Kanetkar – “Let us C” – BPB Publications, Twelfth Edition 2006.
3. Ashok N. Kamthane – “Programming in C”, Pearson Education, Second Edition, 2011

**Reference Books**

1. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest – “Introduction to algorithms ”, Tata McGraw Hill , Third Edition 2003.
2. Byron Gottfried – “Programming with C”, Tata McGraw Hill, Third Edition, 2010.

**CA1DALPL:Digital Electronics and Assembly Language Programming Lab**  
**3 Hours /Week**

Session	Part - A
1	NAND as universal gate using IC 7400
2	NOR as universal gate using IC7402
3	Half adder and realization of full adder using two Half Adders (Basic gates and XOR gates)
4	R-S Flip flop and D Flip flop IC7400 (with and without clock)
5	Shift Register using IC7495
6	Decade counter using IC7490 and BCD to Seven Segment conversion IC7447
	<b>Part - B</b>
7	Program to load four internal registers with data from four consecutive locations in memory using direct addressing mode and indirect addressing mode.
8	To add two binary numbers each 8 bit long with and without carry.
9	To subtract two binary nos each 8 bit long with and without considering borrow.
10	To find the largest number in a given string and store it in a particular location.
11	To find the smallest number in a given string and store it in a particular location.
12	8 bit and 16 bit multiplication.

**Practical Examination Question Paper Pattern**

**Part – A** : Two Questions from ‘Part A’ will be given by the examiner and one will be answered and executed by the students.

**Part – B** : Two Questions from ‘Part B’ will be given by the examiner and one will be answered and executed by the students.

**Scheme of Evaluation:**

Writing two Programs	10 Marks
Execution of Two programs	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

**CA1CPL : 'C' Programming Lab**  
**3 Hours /Week**

Session	'C' Programming
1	Simple examples on Sequential structure with operators
2	Programs using Selective Controls
3	Illustration of Multi-way Selection control
4	Programs on Looping Controls
5	Programs using functions
6	Illustration of function 'Call by Value' and 'Call by Reference'
7	Recursive functions
8	Demonstrate the concept of Arrays ( 1D & 2D) & Strings
9	Illustrate the use of pointers
10	Illustration of structure & nested structure
11	Demonstrate the concept of union
12	Demonstrate Bitwise operations
13	Simple examples using preprocessor directives
14	Demonstrate the concept of text files
15	Demonstrate the concept of binary files

**Practical Examination Question Paper Pattern**

**Part – A** : Three Questions from 'C' Programming module to be given by the examiner and two questions will be answered and executed by the students of their choice.

**Part – B** : One Question from outside the list of programs to be given by the examiner and will be answered and executed by the student.

**Scheme of Evaluation :**

<b>Part – A</b>	Writing two Programs	10 Marks
	Execution of Two programs	10 Marks
<b>Part – B</b>	Writing & Execution	05 Marks
Others	<b>Viva-Voce</b>	05 Marks
	<b>Record</b>	05 Marks
<b>Total</b>		<b>35 Marks</b>

## **SECOND SEMESTER**

### **CA2BE:Business English and Communication-II**

52Hours Course

Theory - 4 Hours /week

***Objectives:**To adopt global standards of communication that would span diverse job functions. Skill students in all possible areas of specialization. Train students to be ‘near industry ready’ by the time they graduate from college. Impart language acquisition more than language learning. The main thrust of the course content is clearly controlled by the demands and constraints of the Business world. All modules are specifically designed to make learners attain communicative competence through learner generated activities.*

<b>Business English and Communication – II</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b>	Business Summary	<b>10</b>
<b>II</b> <b>Interviewing Skills</b>	Preparing for an interview, Different types of interview, Interview questions	<b>10</b>
<b>III</b> <b>Telephone Techniques</b>	Listening/Speaking skills, Using effective questioning techniques, Dealing with overseas calls, Dealing with complaints	<b>10</b>
<b>IV</b> <b>Reports</b>	Purpose of Reports, Formal and Informal reports	<b>12</b>
<b>V</b> <b>Recruitment Correspondence</b>	Application Letter, CVs and References, Job Description Letter of Acceptance, Letter of Resignation , Business Vocabulary(Group Discussion: Project/Assignment)	<b>10</b>

#### **Assessment**

- Teachers are constantly assessing students informally in class, through observation, listening and discussion with students. Self, peer and group assessment are used , as well as more formal teacher assessment.  
Students are assessed during the year on their written assignments, oral presentations and annual skills. They are also assessed on their ability to work both collaboratively and independently.

#### **Resources**

- The Department does not follow a set text book but makes use of the large range of resources available in the library.

**CA2MFCA : Mathematical Foundation For Computer Applications –II**

65 Hours Course

Theory –5 Hours /week

Objective: To understand the concepts of coding theory, differential and integral calculus.

Mathematical Foundation For Computer Applications –II		
Module	Description	Hours
<b>I</b> <b>Introduction to Coding Theory</b>	Binary Symmetric Channel, Encoding and Decoding functions, Hamming matrix, Minimum distance, Generator matrix, Parity check matrix, Group codes, Linear codes.	<b>12</b>
<b>II</b> <b>Differential Calculus I</b>	Limit of a function, Algebra of limits, Continuity of a function, Properties of a continuous functions, Differentiability – Differentiability implies continuity Algebra of derivatives, Derivatives of some standard functions - $(ax + b)^m$ , $\log(ax + b)$ , $e^{ax}$ , $\sin(ax + b)$ , $\cos(ax + b)$ , $e^{ax} \sin(bx + c)$ , $e^{ax} \cos(bx + c)$ , Leibnitz theorem	<b>14</b>
<b>III</b> <b>Differential Calculus II</b>	Mean value theorems – Roll’s theorem, Lagrange’s mean value theorem (with Proofs) - Cauchy’s mean value theorem, Maclaurin’s theorem (statements only). Partial Differentiation, Homogenous Functions, Euler’s theorem of Homogenous Functions.	<b>13</b>
<b>IV</b> <b>Integral Calculus</b>	Definition–Standard results - Integral as Limit of Sum, Fundamental Theorem of Calculus (Statement only), Integration of Algebraic and Transcendental Functions Methods of integration, Method by substitution, Integration by partial fractions, Integration by Parts, Definite integrals, properties of definite integrals.	<b>12</b>
<b>V</b> <b>Ordinary Differential Equations</b>	Order and Degree of differential equations, first order and higher degree equations, Solutions of first order first degree differential equations, Variable separable, Equations reducible to variable separable, linear differential equations.	<b>14</b>

**Text Books**

1. D.S.Chandrasekharaiah-”Discrete Mathematical Structures”, PRISM Book PvtLtd.,Second Edition 2009.
2. P.R. Vittal-”Mathematical Foundations”, Margham Publications, Second Edition, 2003
3. S Narayan and P.K.Mittal-” Differential Calculus”, S.Chand& Company Ltd.,Reprint,2011.

**Reference Books**

1. N. P. Bali-” Differential Calculus”, Laxmi Publications (P) Ltd ,New Edition,2011.
2. E .Kreyszig-”Advanced Engineering Mathematics”, Wiley India Pvt. Ltd.,Eighth Edition 2010.



## CA2DS: Data Structures

**52 Hours Course**

**Theory –4 Hours /week**

*Objective: To familiarize with basic techniques of algorithm analysis, master implementation of linked lists, binary trees and graph algorithms*

*Prerequisites: Ability to Apply Knowledge of Mathematics and Knowledge of Programming*

### Course Outcomes

**CO1:** Determine preferred data structures (Arrays, linked lists, stack, queues, trees, graphs) for a given problem

**CO2:** Design algorithms for various operations (creation, insertion, deletion and traversal) on data structures

**CO3:** Explain the applications of data structures

**CO4:** Understand and apply searching techniques (linear, binary, and hashing)

**CO5:** Understand & Apply sorting techniques (Insertion sort, Selection sort, Quick sort, Merge Sort, Exchange sort)

**CO6:** Implement the data structures using a programming language

<b>Data Structures</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Introduction To Data Structures</b>	<b>Algorithm analysis:</b> Knowledge of Programming and Problem solving techniques. Pseudo code, asymptotic notations ( $O, \theta, \Omega$ ). <b>Data Structures:</b> Definition, Classification of Data Structures, Operations on Data Structure, Abstract Data Type, Array as Abstract Data Type.	<b>5</b>
<b>II</b> <b>Linear Data Structures (Arrays &amp; Lists)</b>	<b>Arrays:</b> Definition, representation of arrays (row-major, column-major), operations on arrays, Types of arrays (1D, 2D, multi-dimensional), operations on arrays (insertion, deletion, traversal). String (Array of characters terminated by a null character). String operations - Character manipulation, String length, Concatenation, Sub string and Pattern Matching. <b>Lists:</b> Definition, Types of Linked List (Singly Linked List, Doubly Linked List, Circularly Linked List), Operations on Linked List (Insertion, Deletion, Search). Applications of Linked lists.	<b>12</b>

<b>III</b> <b>Linear Data structures (Queues &amp; Stack)</b>	<b>Stack:</b> Definition, Primitive Operations (Push, Pop), Stack-implementation using Linked List. Applications of stacks (Function calls, recursion, infix to postfix expression, evaluation of postfix expression). <b>Queues:</b> Definition, Primitive Operations (Insertion, Deletion), Queue -Implementation Using Linked List, Double Ended Queue, priority queues, Garbage Collection. Applications of queues.	<b>08</b>
<b>IV</b> <b>Non-Linear Data Structures</b>	<b>Graphs:</b> Concepts, representation of graphs, applications of graphs, BFS & DFS traversal, Shortest path algorithm. <b>Trees:</b> Definition of Trees concept, Binary Tree -Definition with example, Linear and Linked List Representation of Binary Tree's , Expression trees. Binary search trees - concept, Operations -Creation, Insertion, Traversals. Height Balanced Trees – AVL trees, Multi way trees, B-trees, operations on B-tree.	<b>15</b>
<b>V</b> <b>Searching &amp; Sorting</b>	Linear search, Binary search, hashed list searches. General sort concepts, external & internal sorting (insertion sort, selection sort, quick sort, merge sort, Exchange sort)	<b>12</b>

### **Text Books**

1. Seymour Lipschultz – “Data structures with C ”,Schaum’s Series, McGraw-Hill Publications,2011.
2. Yashavant Kanetkar – “Data Structures through C” ,BPB Publications, Second Edition, 2010.

### **Reference Books**

1. Richard F. Gilberg, Behrouz A. forouzan-” Data Structures: A Pseudo code Approach with C”, Thomson Asia Pvt. Ltd., Second Edition 2002.
2. Horowitz and Sahani –“Fundamentals of Data Structures”, Galgotia Publications Pvt. Ltd, New Delhi, Second Edition 2009.

## CA2DMS :Database Management Systems

**52 Hours Course**

**Theory - 4 Hours /week**

*Objective: To provide knowledge of database concepts and gain skills in developing database applications.*

*Prerequisites: Analytical and logical skills with knowledge of data structures.*

### Course Outcomes

**CO1:** Understand database concepts, data models and architecture

**CO2:** Understand relational algebra and normalize databases.

**CO3:** Apply SQL queries to retrieve and manage databases

**CO4:** Gain knowledge about indexing, transaction processing and concurrency techniques

**CO5:** Learn T-SQL, cursors, triggers and stored procedures and apply it to generate simple queries to manage data

<b>Database Management Systems</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Database Concepts &amp; Data Modeling</b>	<p><b>Databases and Database Users:</b> Introduction, Characteristics of Database Approach, Database Users, Role of Database Administrator, Advantages of DBMS.</p> <p><b>Database System Concepts and Architecture:</b> Data Models, Schemas and Instances, Categories of Data models, DBMS Architecture and Data Independence, Database Languages.</p> <p><b>Data Modeling Using Entity Relationship Model</b> High level Conceptual Data Model for Database Design, Entity Types, Entity Sets, Attributes and Keys, Relationships, Relationship Types, Roles and Structural Constraints, Weak Entity Types.</p>	<b>10</b>
<b>II Relational Data Model and Design</b>	<p><b>Relational Model Concepts:</b> Domains, Attributes, Tuples and Relations, Characteristics, Relational Model Notation, Relational Model Constraints, Domain Constraints, Entity Integrity, Referential Integrity and Foreign Keys.</p> <p><b>Relational Algebra:</b> Operations-Select and Project Operations, Union, Intersection, Difference, Cartesian Product.</p> <p><b>Functional Dependencies and Normalization for Relational Databases-</b> Normalization Concepts, First, Second and Third Normal Forms, Boyce Codd Normal Form.</p>	<b>10</b>

<p style="text-align: center;"><b>III</b></p> <p style="text-align: center;"><b>Structured Query Language</b></p>	<p><b>Introduction to SQL:</b> Characteristics, Advantages, Data types, Operators, DDL Commands-Create table, Alter table, Drop table, Basic Structure-Select clause, where clause, Aggregate functions-avg, sum, count, min, max functions, Null values, String Functions, Date Functions, Groupby, Having clause, Nested Subqueries, Views, DML Commands -Insertion, Updation, Deletion.</p>	<p><b>10</b></p>
<p style="text-align: center;"><b>IV</b></p> <p style="text-align: center;"><b>Indexing Structures For Files &amp; Transaction Processing Concepts</b></p>	<p><b>Single Level Ordered Indexes</b> – Primary indexes, Clustering indexes and Secondary indexes. Multi-level indexes, Dynamic Multilevel indexes using B-trees (Introductory concepts). Hashing concepts.</p> <p><b>Transaction Processing Concepts:</b> Introduction, Transaction and System concepts - Transaction operations, Transaction states, Desirable properties of Transaction, Schedules and Recoverability.</p> <p><b>Concurrency Control Techniques:</b> Lock-Based Protocols – Locks, Granting of Locks, and Two phase locking protocol and implementation of locking.</p>	<p><b>10</b></p>
<p style="text-align: center;"><b>V</b></p> <p style="text-align: center;"><b>T- SQL</b></p>	<p><b>Introduction:</b> T-SQL Block Structure, Variables &amp; Data types T-SQL Character set, Control Structures.</p> <p><b>Subprograms-</b> Stored Procedures and Functions.</p> <p><b>Triggers-</b> Introduction, Basic Trigger Syntax, Trigger events, Advantages.</p> <p><b>Cursors-</b>Types of Cursors, Cursor Operations, Declaring cursors, Cursor Attributes.</p>	<p><b>12</b></p>

**Text Books**

1. Elmasri Navathe – “Fundamentals of Database Systems” – Pearson Education Asia, Fifth Edition 2016.
2. P.S. Gill-“Database Management Systems”, I.K. International Publishing House Pvt. Ltd, Second Edition 2010.
3. Evan Bayross-“SQL & PL/SQL”, BPB Publications, Third Edition 2009.
4. Sharad Maheswari, Ruchin Jain-“Introduction to SQL and PL/SQL”, Firewall Media, First Edition 2007.

**Reference Books**

1. Seema Kedar-“ Database Management Systems”, Technical Publications, First Edition 2009.
2. Steven Feuerstein, Bill Pribyl, Chip Dawes –“Oracle PL/SQL Language Pocket Reference”, O’Reilly Publications, Fourth Edition 2008.
3. G K Gupta-“Database Management Systems”, Tata McGraw Hill Education Pvt Ltd, First Edition, 2011.
4. Michael M. Gorman,-“Database Management Systems”,A Wiley-QED Publications, First Edition.

**CA2DSL :Data Structures Lab**

**3 Hours /Week**

<b>Sl. No</b>	<b>Exercises</b>
1.	Implement various 1-D array operations ( Creation, Insertion, Deletion )
2.	Implement 2D array operations ( Any two )
3.	Implement various string operations using pointers ( Length, Concatenation, Substring, Copy )
4.	Implement various operations on singly linked list (Creation, Insertion, Traversal)
5.	Implement stack operations using pointers ( push, pop, process )
6.	Implement various operations on queue using pointers ( Insertion, Deletion, Process)
7.	Implement circular queue
8.	Implement various operations on Binary Search Trees ( Creation, Insertion, Deletion, Process )
9.	Implement Binary tree traversals ( Pre-order, In-order, Post-order )
10.	Implement conversion of infix expression to its postfix form
11.	Implement evaluation of postfix expression
12.	Implement sort algorithms(Insertion sort, Merge sort, Quick sort, Heap sort)
13.	Implement search algorithms( Linear & Binary search )
14.	Implement Shortest Path Algorithm

**Practical Examination Question Paper Pattern**

Three Questions to be given by the examiner and two questions will be answered and executed by the students of their choice.

**Scheme of Evaluation:**

<b>Writing two Programs</b>	10 Marks
<b>Execution of Two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

**CA2DBSL: Database Management Systems Lab**  
**3 Hours /Week**

**SQL and T-SQL Programming**

<b>Session</b>	<b>Topics</b>
	<b>Section A</b>
<b>1</b>	Data Definition Language Commands
<b>2</b>	Integrity Constraints
<b>3</b>	Data Manipulation Language Commands
<b>4</b>	Data Control Language, Transfer Control Language Commands
<b>5</b>	In Built Functions
<b>6</b>	Set operators
<b>7</b>	Nested Queries And Join Queries
<b>8</b>	Views
	<b>Section B</b>
<b>9</b>	T-SQL Control Structures (Branching, Selection, iterations)
<b>10</b>	Stored Procedures and Functions
<b>11</b>	Triggers and its types
<b>12</b>	Cursors

**Practical Examination Question Paper Pattern**

Two Questions from Section A and one question from Section B will be given by the examiner and two will be answered and executed by the students of their choice.

**Scheme of Evaluation:**

<b>Writing two programs</b>	10 Marks
<b>Execution of two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

## **THIRD SEMESTER**

### **CA3BE :BusinessEnglish And Communication - III**

52 Hours Course

Theory - 4 Hours /week

***Objectives:*** *To adopt global standards of communication that would span diverse job functions. Skill students in all possible areas of specialization. Train students to be ‘near industry ready’ by the time they graduate from college. Impart language acquisition more than language learning. The main thrust of the course content is clearly controlled by the demands and constraints of the Business world. All modules are specifically designed to make learners attain communicative competence through learner generated activities.*

<b>Business English And Communication - III</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Interpreting Texts</b>	a)Prose b) Poetry c) Essay	<b>12</b>
<b>II</b> <b>The world of Business Communication</b>	Basic skills of Reading, Writing, Speaking , Listening	<b>10</b>
<b>III</b> <b>Building Relationships</b>	Networking, Building Trusts, Dealing with difficult people, Making Decisions	<b>10</b>
<b>IV</b> <b>Persuasive Communication</b>	Newsletters, Questionnaires, Invitations, Brochures, Banners Pamphlets	<b>10</b>
<b>V</b> <b>Virtual Skills</b>	E-mail, Blogs, Chat and Fax messages	<b>10</b>

#### **Assessment**

- Teachers are constantly assessing students informally in class, through observation, listening and discussion with students. Self, peer and group assessment are used , as well as more formal teacher assessment.
- Students are assessed during the year on their written assignments, oral presentations and annual skills. They are also assessed on their ability to work both collaboratively and independently.

#### **Resources**

The Department does not follow a set text book but makes use of the large range of resources available in the library

**CA3SMCA: Statistical Methods for Computer Applications**

65 Hours Course

Theory –5 Hours /week

<b>Statistical Methods for Computer Applications</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Introductory concepts</b>	Importance of Statistics, population and sample, types of data – qualitative, quantitative, nominal, ordinal, univariate, bivariate, cross sectional, time series, discrete, continuous, primary, secondary, data collection methods, scales of measurement – nominal, ordinal, interval, ratio, variables and attributes, organization and presentation of data, construction of frequency distributions, presentation of data through diagrams and graphs.	<b>8</b>
<b>II Univariate Data Analysis &amp; Bivariate Data Analysis</b>	Measures of location or central tendency - arithmetic mean , median, mode, quartiles, measures of dispersion - range, quartile deviation, variance and standard deviation, coefficient of range, coefficient of quartile deviation and coefficient of variation for ungrouped and grouped data. Linear correlation - definition, types of correlation, scatter diagram, product moment correlation coefficient - properties, related variables, regression equation, regression coefficient and its properties.	<b>18</b>
<b>III Probability, Random variables &amp; Theoretical distributions</b>	Random experiment, trial, event, sample space. definition of exhaustive, mutually exclusive, equally likely, complementary, favorable, simple and composite events. Definition of probability. Addition and multiplication theorems of probability (Statements only). Conditional probability and independent events. Random variables – definition, discrete and continuous random variables, probability mass and density functions, mathematical expectation, variance. Binomial, Poisson, normal distributions – probability functions, statement of their mean and variance and important properties.	<b>15</b>
<b>IV Statistical Inference</b>	Statistical hypotheses – null, alternative, simple and composite, type I and type II errors, level of significance. Tests of significance for population mean, equality of two population means (large and small samples), population proportion and equality of two population proportions and chi-square test for independence of attributes.	<b>14</b>
<b>V Application of Statistics in Computers</b>	Application : Reference to the mentioned types of data, statistical measures, representation of data and analysis of data in Computer Applications in the areas of Data Mining, Computer Graphics, Image Processing, Machine Learning, Text Mining, Web Mining and others. Representation : Diagrammatic and Graphical Representation of data, Univariate data analysis, Bivariate data analysis, Statistical Inference-1, Statistical Inference -2 using computer based tool.	<b>10</b>



**Reference Books**

1. Ronald E Walpole & Raymond h Myers , Sharon L Myers: “Probability & Statistics for Engineers and scientists” Pearson Education. Ninth Edition 2016.
2. Trivedi et al: “Probability & Statistics with Computer Applications”, Tata Mc. Graw-hill.
3. Richard A Johnson and C.B. Gupta: “Miller and Freund’s Probability and Statistics for Engineers”, Pearson Education, Seventh Edition 2005.
4. Gupta .S.C. and Kapoor .V.K.,“Fundamentals of Mathematical Statistics”, Sultan Chand & Co, Second Edition 1971.
5. Roger.E.Kirk, “Statistics, An Introduction”,Harcourt Brace College Publishers,4th Edition 2007.
6. J.Medhi , “Statistical Methods – an Introductory Text”, New Age Publishers, First Edition 2005
7. Sheldon M. Ross, “Introductory Statistics “,Academic press, Third edition 2010.
8. Harry Frank & Steven C. Althoen, “Statistics- Concepts and Application”, Cambridge Low price Edition 1994.
9. Prem S. Mann, “Introductory Statistics”,Wiley publications, Seventh Edition 2010.
10. Bhattacharya and N.L. Johnson, “Statistical concepts”, John Wiley, 1977.

## CA3OOPJ :Object Oriented Programming Using Java

**52 Hours Course**

**Theory –4 Hours /week**

**Objective: To create User interface and Network based Applications.**

**Prerequisites: Basic Knowledge of Programming**

### Course Outcomes

**CO1:** Understand object oriented principles and analyze language fundamentals

**CO2:** Apply the principles of Object oriented programming and write simple java programs, debug and execute them

**CO3:** Handle exceptions efficiently and apply threading techniques to improve program efficiency

**CO4:** Design dynamic and interactive applets and implement event handling mechanism

**CO5:** Design and develop applications with Graphical User Interface

**CO6:** Understand the hierarchy of I/O streams and write programs to handle file operations

<b>Object Oriented Programming Using Java</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Fundamentals of Java</b>	<b>Overview of Java :</b> Evolution of Java, Java Features, Java and Internet, Java and World Wide Web, Web Browsers, Hardware and Software Requirements, Java Environment. Simple Java program, Java Virtual Machine, Constants, Variables, and Data Types, Declaration of Variables, Scope of Variables, Type Casting, Operators and Expressions, Precedence of Arithmetic Operators, Type Conversion. Branching control structures ( if, ?:, switch etc.,) Looping control structures ( for, while,do-while ). Break, continue statements. Command line arguments.	<b>10</b>
<b>II Classes, Arrays &amp; Strings</b>	<b>Classes, Objects and Methods:</b> Introduction, Defining a Class, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Understanding static , final, nested classes & inner classes, using command line arguments. <b>Inheritance:</b> Extending a Class, using super, Creating a multilevel hierarchy, Method overriding, Dynamic method dispatch, using abstract classes Overriding Methods, Final Variables and Methods, Finalize methods, Abstract Methods, using final with inheritance. <b>Arrays &amp;Strings:</b> Arrays, One-dimensional and Two -Dimensional Arrays, creation, usage, Strings, Wrapper Classes.	<b>10</b>
<b>III Interfaces, Packages, Exception Handling &amp; Multithreaded Programming</b>	<b>Interfaces( Multiple Inheritance ) :</b> Introduction, Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interface Variables. <b>Packages ( Putting Classes together ) :</b> Introduction, Java API Packages, creating Packages, accessing a Package, using a Package and system packages. <b>Exception Handling :</b> Errors and Exception - Introduction, Types of Exception Handling Code, Multiple Catch Statements, Using Finally Statement, Throwing Our Own Exceptions, Using Exceptions for Debugging . <b>Multithreaded Programming:</b> Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a thread, Life Cycle of a thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the ‘Runnable’ Interface.	<b>12</b>

<b>IV</b> <b>Event Handling</b>	<b>Applet Programming:</b> Introduction, Difference between an Applet and an Application, Building Applet Code. <b>Graphics programming:</b> Introduction, The Graphics Class, Drawing Lines, rectangles, circles, Ellipses, Arcs and Polygons. <b>Event handling mechanism:</b> Delegation Event Model, Exploring JavaFX with Scene Builder.	<b>15</b>
<b>V</b> <b>Input / Output files</b>	<b>Input/Output Files in JAVA:</b> Introduction, Concept of Streams, Stream Classes, Byte Stream Classes, Character Stream Classes, Using Streams, Other Useful I/O Classes, Using the File Class, Input / Output Exceptions, Creation of Files, Reading / Writing Characters, Reading / Writing Bytes, Handling Primitive Data Types, Interactive Input and output.	<b>5</b>

**Text Book**

1. E.Balaguruswamy, "Programming with JAVA", A Primer, TMH, Fourth Edition, 2010.

**Reference Books**

1. Herbert Schildt, "JAVA 2 Complete Reference", Osborne /Tata McGraw-Hill Publisher Fifth Edition, 2002.
2. Paul Deitel & Harvey Deitel, "Java How to program", Prentice Hall, Ninth Edition, 2014.

## CA3OS:Operating System

**52 Hours Course**

**Theory - 4 Hours /week**

**Objective: To understand functionalities of operating system and its role in managing various computer resources.**

**Prerequisites: Basic knowledge of data structures.**

### Course Outcomes

**CO1:** Understand the structure and functionalities of an Operating System. and the concept of process

**CO2:** Understand CPU Scheduling algorithms

**CO3:** Describe different memory management techniques

**CO4:** Describe different disk space allocation methods and free space management techniques

**CO5:** Learn Case Studies of Linux and Windows Operating Systems

<b>Operating System</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Operating System Overview and System Structures</b>	<p><b>Introduction :</b> Introduction to Operating Systems, Evolution of Operating Systems, Types of Operating Systems: Early Systems, Multi-programming, Time-Sharing, Distributed Systems and Real-time Systems. Operating System Structures, System components, Operating system Services, System Calls, System programs.</p>	<b>10</b>
<b>II Process Management</b>	<p><b>Process Concept:</b> Process States, Process Control Block, Process Scheduling, Interprocess Communication.</p> <p><b>Process Scheduling:</b> Scheduling Criteria, CPU Scheduling, CPU Scheduling Algorithms, Algorithm Evaluation.</p> <p><b>Process Synchronization &amp; Deadlocks:</b> Critical-Section Problems-Producer Consumers Problem, Readers and Writers Problem, Dining Philosophers Problem. Semaphores, Monitors, Deadlock characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Recovery from Deadlock.</p> <p><i>Process Management in Windows and Linux- A discussion</i></p>	<b>12</b>

<p style="text-align: center;"><b>III</b> <b>Memory Management</b></p>	<p><b>Memory management Strategies:</b> Main Memory Management Basic Concepts, Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation. <b>Virtual memory:</b> Demand Paging, Page Replacement, Page Replacement Algorithms, Thrashing. <i>Memory Management in Windows and Linux- A discussion</i></p>	<p style="text-align: center;"><b>12</b></p>
<p style="text-align: center;"><b>IV</b> <b>Storage Management</b></p>	<p><b>File System:</b> File System Organization, File Operations, File Accessing Methods, Directory Structures, File Protection, Allocation Methods, Free-Space Management. <i>File System in Windows and Linux- A discussion</i> <b>Secondary Storage Structure :</b> Disk structure, Disk Scheduling, Algorithms, Disk management, Swap-Space Management.</p>	<p style="text-align: center;"><b>10</b></p>
<p style="text-align: center;"><b>V</b> <b>Protection and Security</b></p>	<p><b>System Protection:</b> Goals of Protection, Principles of Protection, Access Matrix. <b>System Security:</b> Security Problem, Program Threats, User Authentication, Firewalling to Protect System and Networks</p>	<p style="text-align: center;"><b>8</b></p>

**Text Books**

1. Silberschatz Galvin Gagne – “Operating system concepts”, New Delhi: Wiley India Pvt Ltd., Eighth Edition, 2012.
2. William Stallings- “Operating Systems –Internals and Design Principles”-Pearson Education, Fifth Edition, 2009

**Reference Books**

1. Milan Milankovic – “Operating systems concepts and design” –Tata McGraw Hill Publications, Second Edition 1992.
2. Dietel and Dietel- ”Operating System” - Pearson Education, Third Edition, 2004.
3. Tanenbaum, S Andrew, Operating Systems – Design and Implementation, PHI, 2001.

## **CA3JPL :Java Programming Lab**

**3 Hours /week**

<b>Sl. No</b>	<b>Exercises</b>
<b>1.</b>	Implementation of one Dimensional array.
<b>2.</b>	Implementation of two Dimensional array.
<b>3.</b>	Demonstrate compile time polymorphism a. Constructor overloading. b. Method Overloading
<b>4.</b>	Illustrate the usage of inner classes.
<b>5.</b>	Demonstrate Command Line Arguments.
<b>6.</b>	Demonstrate Simple Inheritance.
<b>7.</b>	Demonstrate Multilevel Inheritance.
<b>8.</b>	Illustrate Method Overriding.
<b>9.</b>	Illustrate the significance of Interfaces.
<b>10.</b>	Implement user-defined packages and show its usage.
<b>11.</b>	Illustrate the use of static, this and super keywords
<b>12.</b>	Illustrate Exception Handling.
<b>13.</b>	Illustrate string methods.
<b>14.</b>	Demonstrate the Creation of Multiple Threads.
<b>15.</b>	Develop a Simple applet.
<b>16.</b>	Write applets to draw the following shapes a. Line b. Circle & Filled circle c. Polygon d. Bar charts
<b>17.</b>	Event Handling using JavaFX

### **Practical Examination Question Paper Pattern**

Three Questions to be given by the examiner and two questions will be answered and executed by the students of their choice.

#### **Scheme of Evaluation:**

<b>Writing two Programs</b>	10 Marks
<b>Execution of Two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

**CA3VPL: Visual Programming Lab**

**3 Hours /Week**

<b>Topics</b>	
<b>Section A: Working with Basic Intrinsic &amp; Container Controls</b>	
1	Simulate a Calculator
2	Manipulating items in Listbox and combo box controls
3	Generating Report Card
4	Generating Bill for Restaurant
5	Font Dialog Box
6	Validation of User Input
7	Swapping Pictures using Timer control
8	Exploring Menu Editor
<b>Section B: Working with ActiveX Data Objects (Database Programming)</b>	
9	Authenticating User Credentials
10	Data Binding using Combo Box control and Retrieving records in the database
11	Data Binding using Data GridView control and Inserting records in the database
12	Viewing records in a Data control and Updating records in the database
13	Viewing records in a Data Control and Deleting records in the database

**Practical Examination Question Paper Pattern**

Three Questions to be given by the examiner and two questions will be answered and executed by the students of their choice.

**Scheme of Evaluation:**

<b>Writing two Programs</b>	10 Marks
<b>Execution of Two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

## **FOURTH SEMESTER**

### **CA4BE:Business English And Communication–IV**

52 Hours Course

Theory - 4 Hours /week

***Objectives:*** To adopt global standards of communication that would span diverse job functions. Skill students in all possible areas of specialization. Train students to be 'near industry ready' by the time they graduate from college. Impart language acquisition more than language learning. The main thrust of the course content is clearly controlled by the demands and constraints of the Business world. All modules are specifically designed to make learners attain communicative competence through learner generated activities.

<b>Business English And Communication - IV</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Interpreting Texts</b>	a)Prose b)Poetry c) Essay	<b>12</b>
<b>II Business Ethics &amp; Etiquette</b>	Corporate image, Business dining, Interaction with foreign visitors, Business manners in different countries	<b>10</b>
<b>III Conflict Management</b>	Characteristics of Conflict, Management of Conflict	<b>10</b>
<b>IV Meetings</b>	Documentation, Meetings in Business, Types of meeting, Chairing a meeting, Minutes of a meeting	<b>10</b>
<b>V Business Language Component</b>	Grammar Building Exercises, Vocabulary	<b>10</b>

#### **Assessment**

- Teachers are constantly assessing students informally in class, through observation, listening and discussion with students. Self, peer and group assessment are used , as well as more formal teacher assessment.
- Students are assessed during the year on their written assignments, oral presentations and annual skills. They are also assessed on their ability to work both collaboratively and independently.

#### **Resources**

The Department does not follow a set text book but makes use of the large range of resources available in the library.



## **CA4AFM:Accounting and Financial Management**

65 Hours Course

Theory – 5 Hours /week

*Objective: To familiarize with the basic concepts of Accounting and the steps involved in preparing the Financial statements and interpreting the statements for decision making*

<b>Accounting and Financial Management</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b>	Introduction-Meaning and Definition of Accounting- Concepts and Conventions, Users of Accounting Information, Double Entry System, Preparation of Journal and Ledger	<b>14</b>
<b>II</b>	Subsidiary Books- Purchase Book, sales Book, Purchase Returns, Sales Returns, Bills Receivable, Bills Payable, Journal Paper-Preparation of Subsidiary Books- Cash Books, Three Column Cash Book- Simple Problems.	<b>12</b>
<b>III</b>	Trial Balance-Preparation of Final Accounts- For Sole Traders and Joint Stock Companies(Simple Problems)	<b>14</b>
<b>IV</b>	Financial Management-Meaning, Scope, Objectives, Financial Planning, Financial Decisions Overview of GST – Meaning, Definition, objectives, Features, Scope, Types, Benefits of Implementing GST.	<b>10</b>
<b>V</b>	Financial Statement Analysis- Meaning-Need-Types-Methods of financial Statement Analysis-Comparative-Common size and Trend Analysis(Simple Problems-Meaning Of Ratio Analysis-Funds –Funds Flow and Cash Flow Analysis (Only Theory)	<b>15</b>

### **Text Books**

1. S.P Jain &Narang-“Financial Accounting”, Kalyani Publishers, Thirteenth Edition 2002.
2. R.L Gupta-“Financial Accounting”, Sultanchand& Sons, 2011
3. R.K Sharma &Shashi Gupta-“Financial Management”,Oscar publications.
4. Khatoon, Kumar, Venkatesh S.N, “Goods and Services Tax”, Himalaya Publishing House

## CA4WP:Web Programming

**52 Hours Course**

**Theory - 4 Hours /week**

**Objective:** Understand the importance of web as medium of communication and develop skills to create dynamic web pages.

**Prerequisites:** Basic Programming Knowledge & Creative thinking to design website

### Course Outcomes

**CO1:** Understand the elements of HTML and design static web pages

**CO2:** Develop interactive web pages using JavaScript and dynamic HTML

**CO3:** Get familiarized with .net framework and understand the Object Oriented programming concepts in C# to implement programming logic in Asp.net.

**CO4:** Understand database connectivity using ADO.net and develop dynamic websites using Asp.net

**CO5:** Gain knowledge of state management and data binding in Asp.net

**CO6:** Learn basics of PHP and apply it to develop dynamic websites

<b>Web Programming</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b>  <b>Understanding Web Technologies</b>	<p><b>Fundamentals of Web:</b> History of Internet, Internet Services , WWW, Web Browser and Web Server.</p> <p><b>HTML:</b> Introducing HTML and XHTML, Basic text formatting, Presentational elements, Phrase elements, Lists, Editing text, Using Character entities for special characters, Links and Navigation, Images, Audio and Video, Tables, Forms, Frames.</p> <p><b>Java Script:</b> Introduction to Java script, Features of Java Script, Including Java Script in HTML file, Simple Examples, Communicating with user – alert(), prompt(), confirm() methods, Function, Creating Interactive forms, Working with form elements.</p> <p><b>DHTML:</b> Cascading Style Sheets-Coding CSS, Inline Style Sheets, Embedded Style Sheets, CSS Positioning, Document Object Model, Event handling.</p>	<b>15</b>
<b>II</b>  <b>Introduction to .NET Architecture &amp; Object-oriented concepts in C#</b>	<p><b>.NET framework :</b> Common Language Runtime, Common Language Specification, Common Type System, MSIL, Garbage Collection, Security, Application domains -, Framework base classes, Assemblies, Namespaces, .Net Applications using C#, Advantages of .Net, Role of C# in .Net Framework. <b>Classes &amp; Objects:</b> Defining a class, member access modifiers, constructors ,types of constructors, destructor, ‘this’ reference, constant and read only members, properties, indexers. <b>Inheritance &amp; Polymorphism:</b> Classical &amp; containment inheritance, multilevel, hierarchical inheritance, operator overloading, overriding methods, abstract classes &amp; methods, sealed classes &amp; methods, polymorphism. <b>Interfaces:</b> Defining, extending, and implementing an interface, Interfaces &amp; Inheritance, Abstract Class and Interfaces. <b>Delegates:</b> Introduction, declaration, methods, instantiation, invocation, using delegates, events.</p>	<b>15</b>

<b>III</b> <b>Programming in ASP.Net &amp; Database Connectivity using ADO.Net</b>	<b>Introduction to ASP.Net:</b> ASP.Net File Types, Applications, Code Behind technique, Global.asax File, Application Events. ASP.Net Configuration – Web.config file. <b>Exploring Controls</b> – Standard controls, Data controls, Validation Controls, Handling Events. <b>ADO.Net:</b> Characteristics, ADO.Net Object Model, ADO.Net Data Access – Creating Connection, Command Object, Reading using DataReader Object, Updating data, Disconnected Data – Accessing, Modifying, Updating, Master Pages & Themes.	<b>10</b>
<b>IV</b> <b>State Management &amp; Data Binding</b>	<b>State Management:</b> Viewstate, Querystring, Cookies, Session, Application. <b>Data Binding:</b> ListBox, DropDownList, CheckBox List, RadioButton List, Data Binding using Templates - Data List, Data Grid, Repeater, Form View, Page View.	<b>5</b>
<b>V</b> <b>PHP</b>	<b>Introducing PHP:</b> PHP Language Basics, Decisions and Loops, String, Array, Functions, Writing simple PHP programs. <b>Working with databases:</b> Creating MySQL database, Inserting Data, Accessing database in PHP, Updation and deletion of data items.	<b>7</b>

### Text Books

1. Deitel & Deitel ,“Internet & World Wide Web –How to Program”, Pearson Education, Fourth Edition, 2009.
2. Jon Duckett, “ Beginning HTML, XHTML, CSS and JavaScript”, Wiley Publications, 2012.
3. Faithe Wempen, HTML 5 Step by Step, Microsoft Press, PHI, 2012.
4. E. Balagursamy, “Programming in C#- A Primer”, Tata McGraw Hill Publications, Third Edition, 2010.
5. Mridula Parihar, “Asp.net Bible”, Wiley-Dreamtech India Pvt.Ltd, First Edition,2002
6. Steven Holzner, “PHP: The Complete Reference”,McGraw Hill Education Pvt Ltd, Reprint 2015

### Reference Books

1. Dr.Ravinder Singh, Amit Gupta, “Magic with HTML, DHTML and Javascript”, Laxmi Publications, First Edition, 2009.
2. Herbert Schildt, “C# 4.0 : The Complete Reference”, Tata McGraw Hill ,2010.
3. MacDonald , “The Complete Reference ASP.NET ”, Tata McGraw Hill,2002 .
4. Matt Doyle, “Beginning PHP 5.3”, Wiley Publishing, 2010

**CA4UP :Unix Programming**

**52 Hours Course**

**Theory - 4 Hours /week**

**Objective: To understand file system and resource management in Unix environment and also learn fundamentals of shell scripting.**

**Prerequisites: Basic knowledge of Operating System.**

**Course Outcomes**

**CO1:** Understand Unix Operating System fundamentals and architecture

**CO2:** Explore basic Shell Commands and write shell scripts

**CO3:** Compile, debug and execute shell scripts

**CO4:** Gain knowledge in awk programming and write efficient awk scripts

**CO5:** Understand various system functions, utilities and system administration functions and manage the processes and disk space

<b>UNIX Operating System</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Unix Environment and File System</b>	<b>Getting Started:</b> History, Features of UNIX, UNIX System Architecture, Types of shell, Creating Files, Listing Files and Directories, Masking File Permissions, Directory permissions. <b>UNIX File System:</b> Ordinary File, Directory File, Device File, Parent-Child Relationship, Boot Block, Super Block, Inode Table, Data Block, Storage of files, Disk related commands, Directory and File related commands, I/O redirection and piping.	<b>10</b>
<b>II Process Management And Communication</b>	<b>Process Management :</b> Process Creation, Examining Currently Running Process, Background Processes, nohup command, Killing a Process, Changing Process Priorities, Scheduling of Processes. <b>Communication :</b> Communication Commands: write, wall, motd commands, Sending Mail, Handling Incoming Mail.	<b>9</b>
<b>III Special Tools And Awk Programming</b>	<b>Special Tools And Utilities:</b> Filters, UNIX System calls - Writing Simple File and Process System Calls: open(), read(), write(), fork(), exit(), wait(), exec(), getpid(), close(). Library Functions, Signals and Interrupts, Storage and Compressing Facilities. <b>Programming With Awk:</b> Awk Preliminaries, Splitting a line into fields, Formatting Output, Comparison Operators, Variables, Positional Parameters, Arrays, Functions, Control Flow, Looping structures.	<b>10</b>
<b>IV System Administration and Disk Management</b>	<b>System Administration:</b> User and Super User Privileges and facilities, Maintaining User Accounts, Maintaining Security. <b>Disk Management:</b> File System Mounting and Unmounting, Backing up and Restoring Files: cpio and tar commands, Managing Disk Space.	<b>8</b>

<p style="text-align: center;"><b>V</b> <b>Shell</b> <b>Programming</b></p>	<p><b>Shell Programming:</b> Shell variables, Shell Command Line Processing, Shell Script Features, Executing a Shell script, Read and Echo statement, Command Substitution, Escape Sequence Characters, Shell Script Arguments, File test, String test, Numeric test, Conditional Control Structures-if statement, case statement Looping Control Structure-while, until, for, statements. Jumping Control Structures – break, continue, exit statements. <b>Loadable Kernel Module:</b> Introduction to Linux Kernel Modules, Writing Linux kernel modules.</p>	<p style="text-align: center;"><b>15</b></p>
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**Text Books**

1. Yeshwant Kanetkar, “UNIX shell Programming”, BPB Publications, First Edition,1996.
2. Sumitabha Das,”Your Unix- The Ultimate Guide”, Tata McGraw-Hill, 2001 Edition, Twentieth Reprint 2010.
3. Subhash K.U, ” UNIX System Programming”, Pearson Education India, Fourth Edition, 2011.

**Reference Books**

1. M.G Venkateshmurthy, “Introduction to UNIX Shell Programming”, Pearson Education, First Edition,2006.
2. Maurice J Bach , “The Design of Unix Operating System”, New Delhi: Prentice Hall of India Pvt. Ltd, 2008.
3. Neil Matthew, Richard Stones, “Beginning Linux Programming”, John Wiley & Sons, Fourth Edition, 2011.

## **CA4WPL : Web Programming Lab**

**3 Hours /week**

<b>Sl. No</b>	<b>Section A: Web Technologies</b>
<b>1</b>	Design simple HTML pages to illustrate Ordered, Unordered & Definition Lists Tables Frames Form elements
<b>2</b>	Web page validation using Java script.
<b>3</b>	Create web page using CSS.
<b>4</b>	Event handling using DHTML.
<b>5</b>	Demonstrate the significance of cookies using PHP.
<b>6</b>	Develop a home page for a website using PHP.
	<b>Section B : C# &amp; Asp.net</b>
<b>7</b>	Demonstrate Constructor Overloading.
<b>8</b>	Demonstrate Method Overloading
<b>9</b>	Demonstrate Method Overriding.
<b>10</b>	Demonstrate Multilevel Inheritance.
<b>11</b>	Demonstrate Delegates and Events.
<b>12</b>	Create a web page to demonstrate server controls in asp.net.
<b>13</b>	Demonstrate validation controls in asp.net.
<b>14</b>	Develop web application to view and update data in database.
<b>15</b>	Create a web application to view and delete data in database.
<b>16.</b>	Develop web application to insert data in to database.

### **Practical Examination Question Paper Pattern**

Two questions from Section A and one question from Section B would be given by the examiner and two questions will be answered and executed by the students of their choice.

#### **Scheme of Evaluation:**

<b>Writing two Programs</b>	<b>10 Marks</b>
<b>Execution of Two programs</b>	<b>15 Marks</b>
<b>Viva-Voce</b>	<b>05 Marks</b>
<b>Record</b>	<b>05 Marks</b>
<b>Total</b>	<b>35 Marks</b>

## **CA4UPL:Unix Programming Lab**

**3 Hours /week**

<b>Sl. No</b>	<b>Section A</b>
<b>1.</b>	Interactive shell script to copy, remove and rename files.
<b>2.</b>	Demonstrate the commands used for System communication.
<b>3.</b>	Shell script to append data to a file, provided the file has write permission.
<b>4.</b>	Menu driven shell script to perform the following operations. ✓ Display the contents of a file. ✓ Sort the contents. ✓ Search for a pattern in the file ✓ Exit
<b>5.</b>	Menu driven shell Script to generate pay slip for employee.
<b>6.</b>	Shell script that receives two file names as arguments and compare its contents.
<b>7.</b>	Shell script to find the largest of three numbers using command line argument.
<b>8.</b>	Shell script to count the number of vowels in a string.
<b>9.</b>	Shell script to reverse a string.
<b>10.</b>	Shell script to remove the files of same size in the current directory.

	<b>Section B</b>
<b>11.</b>	Demonstrate system calls to perform file operations in Unix.
<b>12.</b>	Demonstrate system calls for process management in Unix.
<b>13.</b>	Awk script to count the number of lines in a file that do not contain vowels
<b>14.</b>	Awk script to demonstrate functions.
<b>15.</b>	Awk script to demonstrate array operations.
<b>16.</b>	Shell script to generate report card.
<b>17.</b>	Shell script to generate invoice for purchased items.
<b>18.</b>	Shell script to generate electricity bill.

### **Practical Examination Question Paper Pattern**

Two questions from Section A and one question from Section B would be given by the examiner and two questions will be answered and executed by the students of their choice.

#### **Scheme of Evaluation:**

<b>Writing two Programs</b>	10 Marks
<b>Execution of Two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

**FIFTH SEMESTER**  
**CA5CN:Computer Networks**

52 Hours Course

Theory –4 Hours /week

**Objective:** To gain fundamental understanding of the computer network principles, protocols, architecture concepts and applications.

**Prerequisites:** Knowledge of computer hardware and any one programming language

**Course Outcomes**

**CO1:** Understand basic concepts of networks, network hardware and network software and describe various standard network models

**CO2:** Understand data communication, various transmission media and familiarize with modulation, multiplexing and switching.

**CO3:** Analyze error detection and correction, data link protocols, understand the role of medium access control sub layer

**CO4:** Implement and analyze routing and congestion issues in network design

**CO5:** Familiarize with network security, DNS, email and encryption algorithms

<b>Computer Networks</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Introduction</b>	<b>Uses of Computer Networks :</b> Networks for companies, networks for people, Social issues. <b>Network Hardware:</b> Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless networks, Internetworks. <b>Network Software:</b> Protocol Hierarchies, Design Issues for the Layers, Interfaces and services, Connection-Oriented Versus Connectionless Service. <b>Reference Models:</b> The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models.	<b>6</b>
<b>II</b> <b>Physical Layer</b>	<b>The Theoretical Basis for Data Communication:</b> Fourier Analysis, Bandwidth-Limited Signals, The Maximum Data Rate of a Channel. <b>Transmission Media:</b> Guided transmission media, wireless transmission, Communication satellites. <b>Digital Modulation And Multiplexing :</b> Baseband Transmission, Passband Transmission, Frequency Division Multiplexing, Time Division Multiplexing. <b>The Telephone System :</b> Switching.	<b>8</b>
<b>III</b> <b>MAC Sub Layer and Data Link Layer</b>	<b>Data Link Layer Design Issues:</b> Services Provided to the Network Layer, Framing, Error Control, Flow Control. <b>Error Detection And Correction:</b> Error-Correcting Codes, Error-Detecting Codes. <b>Elementary Data Link Protocols :</b> A Simplex Stop-and-Wait Protocol for a Noisy Channel. <b>Sliding Window Protocols:</b> A One-Bit Sliding Window Protocol, A Protocol Using Go-Back-N, A Protocol Using Selective Repeat. <b>MAC Sub Layer :The Channel Allocation Problem:</b> Static and dynamic Channel Allocation. <b>Multiple Access Protocols:</b> ALOHA, Carrier Sense Multiple Access	<b>10</b>



	<p>Protocols, Collision-Free Protocols.  <b>IEEE standard 802 For LANS And MANS:</b> Ethernet, 802.4 – Token Bus, 802.5 – Token Ring) Working and frame formats.  <b>Wireless LANS :IEEE 802.11:</b> Working and frame format .  <b>Data Link Layer Switching :</b> Repeaters, Hubs, Bridges, Switches, Routers, and Gateways.</p>	
<p><b>IV</b></p> <p><b>Network Layer and Transport Layer</b></p>	<p><b>Network Layer Design Issues:</b> Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks.  <b>Routing Algorithms:</b> The Optimality Principle, Shortest Path Algorithm, Flooding. <b>Congestion Control Algorithms :</b> Approaches to Congestion Control, Traffic Shaping. <b>Quality Of Service:</b> Application Requirements, Traffic Shaping. <b>The Network Layer In The Internet :</b> The IP Version 4 Protocol, IP Addresses, IP Version 6, Internet Control Protocols, Internet of things.  <b>Transport Layer: Elements of Transport protocols:</b> Addressing, Connection Establishment, Connection Release, Error Control and Flow Control. <b>The Internet Transport Protocols:</b> TCP, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.</p>	<p><b>14</b></p>
<p><b>V</b></p> <p><b>Application Layer</b></p>	<p><b>Network Security:</b> Traditional Cryptography, two Fundamental Cryptographic Principles, Secret-Key and Public-Key algorithms, Digital signatures, Social issues.  <b>Symmetric-Key Algorithms:</b> DES—The Data Encryption Standard, AES—The Advanced Encryption Standard.  <b>Domain Name System:</b> The DNS Name Space, Domain Resource Records, Name Servers.  <b>Electronic Mail:</b> Architecture and Services, The User Agent, Message Formats, Message Transfer.  <b>Communication Security:</b> Firewalls.</p>	<p><b>14</b></p>

**Text Book**

1. Andrew S Tanenbaum– “ Computer Networks” – PHI ,Fifth Edition, 2010.

**Reference Books**

1. William Stallings – “ Data and Computer Communications” – Pearson Education Asia, Seventh Edition,2001
2. Douglas E Comer - “Computer Networks and Internets”, -Pearson Education, 2014.
3. Larry L. Peterson, Bruce S Davie – “Computer Networks: A Systems Approach”, Fourth Edition,2007 (The Morgan Kaufmann Series in Networking)

**CA5SE: Software Engineering**

**52 Hours Course**

**Theory - 4 Hours /week**

**Objective: To provide students a good understanding of software engineering principles and to prepare the students to develop the skills necessary in designing and handling software projects.**

**Prerequisites: Analytical and Logical skills.**

**Course Outcomes**

**CO1:** Understand basic concepts of software engineering and Compare different software engineering process models.

**CO2:** Analyze the principles of requirement Engineering and modeling.

**CO3:** Gain knowledge on software quality assurance.

**CO4:** Understand and apply different testing techniques.

**CO5:** An ability to use the techniques and tools to design a given project.

<b>Software Engineering</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b>  <b>Introduction to Software Process</b>	<p><b>Introduction:</b> Defining software, Characteristics of software, Software Application domains, Legacy software, Software Engineering – Layers, Software process, Software engineering practice – Essence of practice and Software Myths</p> <p><b>Software Process:</b> Process Models, Software Process Framework – Defining a framework activity, Identifying a Task Set, Process Patterns , Process Assessment and improvement, Prescriptive Process Models – The Waterfall Model, Incremental Process Models, Evolutionary Process Models – Prototyping, Spiral Model, Concurrent models, Agile Model.</p>	<b>10</b>
<b>II</b>  <b>Requirements for Software Engineering</b>	<p><b>Understanding Requirements:</b> Requirements Engineering, Establishing the groundwork – Identifying Stakeholders, Recognizing multiple viewpoints, Working toward Collaboration, Asking the first questions-,Eliciting requirements, Developing Use Cases, Building Requirement Model-Elements of Requirement Model, Analysis Pattern , Negotiating and Validating Requirements.</p> <p><b>Requirements Modeling:</b> Requirements Analysis-Overall Objectives and Philosophy, Analysis rules of thumb, Domain analysis, Requirement Modelling Approaches, Scenario based modeling, UML models-Developing Use case, Activity diagram, Data Modelling concepts, Class based modeling.</p>	<b>8</b>

<p style="text-align: center;"><b>III</b></p> <p style="text-align: center;"><b>Software Design Concepts</b></p>	<p><b>Design Process:</b> Software Quality guidelines and attributes, Evolution of Software Design, Design Concepts – Abstraction, Architecture, Patterns, Separation of concerns, Modularity, information hiding, Functional Independence, refinement, Aspects, Refactoring, Object Oriented design concepts Design classes, The design Model – Data Design elements, Architectural Design elements, Interface Design Elements, Component-Level Design elements, Deployment level Design elements. Architectural Design - Defining Architecture and patterns, Component level design – Coupling.</p>	<p style="text-align: center;"><b>12</b></p>
<p style="text-align: center;"><b>IV</b></p> <p style="text-align: center;"><b>Software Quality and Testing Concepts</b></p>	<p><b>Quality Management:</b> Defining quality, Software Quality, Achieving Software Quality, Defect amplification model, Review metrics and their use, Informal reviews, Formal Technical reviews, SQA – elements of SQA,SQA- Tasks, Goals and Metrics, Software Reliability, SQA Plan.</p> <p><b>Software Testing Strategies:</b> Strategic Approach to Software Testing, Test strategies for Conventional Software – Unit testing, Integration testing, Test strategies for Object Oriented Software, Validation testing, System testing, Software testing fundamentals, White-Box testing, Basic path testing, Control structure testing and Black-box testing.</p>	<p style="text-align: center;"><b>12</b></p>
<p style="text-align: center;"><b>V</b></p> <p style="text-align: center;"><b>Software Project Management</b></p>	<p><b>Project Management Concepts:</b> Management Spectrum, Product, Process, Project – signs,W5HH Principle, Metrics in process and project domains, Software Measurement, Metrics for Software Quality, Project Planning process, software project estimation Decomposition Techniques. Estimation Models- COCOMO Model, Basic principles of project Scheduling</p> <p><b>Risk Management:</b> Risk Identification, Risk Projection and RMMM Plan</p>	<p style="text-align: center;"><b>10</b></p>

**Text Book**

1. Pressman S Roger, “Software Engineering A Practitioner’s Approach”, McGraw Hill, International Editions, 7th Edition, 2010.

**Reference Books**

1. Rajib Mall, “Fundamentals of Software Engineering”, PHI Learning Pvt. Ltd, Fourth Edition,2014
2. Pankaj Jalote,”An Integrated approach to Software Engineering”,Narosa Publishing House,3<sup>rd</sup>Edition,2013.

## **CA5AJP: Advanced Java Programming**

**52 Hours Course**

**Theory - 4 Hours /week**

**Objective: Provides a platform to learn the advanced concepts of Java and to develop Network and web based applications.**

**Prerequisites: Knowledge of Core Java.**

### **Course Outcomes**

**CO1:** Create network based and business applications

**CO2:** Implement server side programming and develop dynamic Web Applications

**CO3:** Understand Java Server Pages (JSP) technology and develop powerful GUI based and reusable components using JavaBeans

**CO4:** Identify advanced concepts of java programming with database connectivity

<b>Advanced Java Programming</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Java Network Programming</b>	Networking basics, Java and the Net, Inet address, TCP/IP client sockets, URL connection, TCP/IP server sockets, Datagrams	<b>8</b>
<b>II Java Beans &amp; Swing</b>	Java Beans: What is a Java Bean?, Advantages of Java Beans, Application Builder Tools, Using the Bean Developer Kit, JAR files, Introspection, Developing a Simple Bean Using the BDK, Using Bound Properties, Bean Methods, Bean an Icon, Bean info class, Persistence ,Java Beans API. Swing: JApplet, Icons and Labels, Text Fields, Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, Tables, Exploring Swing.	<b>10</b>
<b>III Servlets</b>	The Life Cycle of a Servlet, Using Tomcat for Servlet Development, A Simple Servlet, The Servlet API, Servlet packaging, HTML building utilities, Single Thread Model Interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating Server Response: HTTP Status codes, Generating Server Response: HTTP Response Headers, Handling Cookies, Session Tracking.	<b>10</b>
<b>IV Java Server Pages</b>	Overview of JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax, Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP , using JSP expressions, comparing servlets and JSP, writing scriptlets. Controlling the Structure of generated servlets: JSP page directive, import attribute, session attribute, isEIgnore attribute, buffer and auto flush attributes, info attribute ,errorPage and isErrorPage attributes, isThreadsafe Attribute, extends attribute, language attribute,	<b>12</b>

	Including files and applets in JSP Pages, Using java beans components in JSP documents.	
<b>V</b> <b>Java Database Connectivity</b>	Talking to Database, Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action : The ResultSet, Batch Updates, Mapping, Basic JDBC Data Types, Advanced JDBC Data Types, Immediate Solutions.	<b>12</b>

### **Text Books**

1. SchildtHerbert, "Java2 : The Complete Reference", Tata McGraw-Hill Professional, Fifth Edition.
2. Marty Hall, Larry Brown, "Core Servlets and Java Server Pages, Volume 1", Prentice Hall Professional, Second Edition, 2004.
3. By Kogent Solution Inc , "Java 6 Programming Black Book, New Ed", Dreamtech Press, New Edition, 2012.

### **Reference Books**

1. Andrew Lee Rubinger, Bill Burke , "Enterprise JavaBeans 3.1: Developing Enterprise Java Components", "O'Reilly Media, Inc. , 2010.
2. Elliotte Rusty Harold , "Java Network Programming: Developing Networked Applications", O'Reilly publishers, Fourth Edition, 2013.
3. Keogh, "J2EE: The Complete Reference", Tata McGraw-Hill Education, 2002.
4. Deitel H.M. &Deitel P.J, "Java: How To Program," Prentice-Hall of India, Fifth Edition, 2003.

## CA5MAD :Mobile Application Development

**52 Hours Course**

**Theory –4 Hours /week**

**Objective: Provide skills to develop applications for modern Smartphone operating systems.**

**Prerequisites: Basic programming language, knowledge of GUI development.**

### Course Outcomes

**CO1:** Understand the basic architecture of Android OS.

**CO2:** Use IDE and SDK for implementing Android applications.

**CO3:** Implement different views, notifications and messaging in apps.

**CO4:** Apply graphics and multimedia libraries in Android.

**CO5:** Design applications to use Maps and database in Android.

**CO6:** Test, publish and deploy apps.

<b>Mobile Application Development</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Introduction to Android</b>	<b>Introduction</b> –Introduction to Android, History of mobile technologies, Benefits and drawbacks of Smartphone programming, Android versions, Android features, Android Architecture, native libraries, SDK overview. <b>“Hello World” program</b> - Creating your first Android application, Anatomy of android Application, Understanding Activities, linking Activities using intents.	<b>8</b>
<b>II</b> <b>Android User Interface</b>	<b>User Interface and Designing with views</b> Understanding the components of a screen, adapting to display orientation, managing changes to screen orientation, layouts, Using Basic Views, Using Picker views, Using List views to display lists, applying a theme, adding a menu, Notifications, debugging with log messages, debugging with debugger.	<b>12</b>
<b>III</b> <b>Graphics &amp; Local Data in Android</b>	<b>Exploring 2D graphics and Multimedia</b> Learning the basics, Adding Graphics, handling input, Using Image Views to display pictures, Playing audio, Playing Video <b>Storing local Data</b> Reading/writing local data, Accessing the Internal File system, Accessing SD card.	<b>12</b>
<b>IV</b> <b>Location Services &amp; Exploring SQLite</b>	<b>Location and Sensing</b> SMS Messaging, Displaying MAPS, Location Data - Monitoring and Tracking a Location, <b>Putting SQL to work</b> Introducing SQLite, SQLiteOpenHelper, Creation, Insertion, Updation and Deletion of data, Data Binding, Using a content provider, Implementing content provider.	<b>10</b>

<p style="text-align: center;"><b>V</b></p> <p><b>Testing and Publishing Android Application</b></p>	<p><b>Testing-</b> significance, different approaches, types, test cases, activities in testing.</p> <p><b>Security-</b> best practices, security with HTTPS and SSL, Android Keystore system, enhancing security with device management policies.</p> <p><b>iOS and iPhone apps-</b> Introduction</p> <p><b>Preparing for Publishing-</b> Versioning, Digitally Signing Your Android Applications. <b>Deploying APK</b> -Using the adb.exe Tool, Using a Web Server, Publishing on the Android Market</p>	<p><b>10</b></p>
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**Text Books**

1. Grant Allen, “Beginning Android 4”, Apress, 2012.
2. Wei-Meng Lee, “Beginning Android 4 Application Development”, John Wiley & sons, Inc, 2012.
3. Ed Burnette, Hello, Android: Introducing Google's Mobile Development Platform, Pragmatic. Bookshelf (2009), ISBN-13: 978-1934356173.

**Reference Book**

1. Jerome (J.F) DiMarzio ,“Android - A programmer's Guide”, Tata McGraw Hill ,2010, ISBN: 9780071070591.

**Elective-I**

**CA5CA : Computer Architecture**

**52 Hours Course**

**Theory – 4 Hours /week**

*Objective: To understand the basic model of a computer on processor design in which data representation and instruction basics, design of an ALU and the concepts of memory design are discussed.*

*Prerequisites: Knowledge of fundamentals of Computer System*

**Course Outcomes**

**CO1:** Identify the transfer of data between registers, instruction codes, timing and control signals and understand the basic organization of memory hierarchy

**CO2:** Understand stack organization and addressing modes in CPU organization

**CO3:** Design and emulate a single cycle or pipelined CPU and quantitatively compare the performance of programs on pipelined and non-pipelined processors.

**CO4:** Understand modes of data transfer , interrupts , direct memory access in input-output organization

**CO5:** Understand memory organization and its purpose

<b>Computer Architecture</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Register Transfer &amp; Basic Computer Organization</b>	<b>Register Transfer and micro-operations:</b> Register transfer language, Register transfer, Bus and memory transfers, and Arithmetic, logic and shift micro operations.  <b>Basic computer organization and design:</b> Instruction Codes, computer registers, Computer registers, Computer Instructions, Timing and control, Memory-Reference Instructions, Input-Output and Interrupt.	<b>10</b>
<b>II CPU Organization</b>	<b>Central Processing Unit :</b> General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).	<b>10</b>
<b>III Microprogram med control &amp; Computer Arithmetic</b>	<b>Microprogrammed Control :</b> Control Memory, Address Sequencing. Pipeline and Vector Processing: Parallel Processing, Pipelining, Vector Processing, Array Processors. <b>Computer arithmetic:</b> Addition and Subtraction, Multiplication Algorithms, Division Algorithms	<b>10</b>



<b>IV Pipelining and I/O Organization</b>	<b>Pipelining:</b> Definition-Pipelined datapath and control <b>Input-output organization:</b> Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA). Input-Output processor (IOP), Serial Communication.	<b>12</b>
<b>V Memory Organization</b>	<b>Memory organization:</b> Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory, Virtual Memory. Multiprocessors-Characteristics of Multiprocessors.	<b>10</b>

### **Text Books**

1. M. Moris Mano, "Computer System, Architecture", Prentice Hall, India, Second Edition.
2. Kai Hwang, Zhiwei Xu " Scalable Parallel Computing Technology, Architecture, Programming" McGraw-Hill Publications(Unit IV- Pipelining)

### **Reference Books**

1. Heuring and Jordan, "Computer systems design and Architecture", Pearson Education
2. William Stallings, "Computer Organization and Architecture", Pearson Education
3. Floyd, "Digital Fundamentals, 8th Edition", Pearson Education.
4. Andrew S. Tanenbaum, "Structured Computer Organization", Prentice Hall, India, Third Edition.

**Elective-I**

**CA5FAFL:Finite Automata and Formal languages**

52 Hours Course

Theory – 4 Hours /week

**Objective:** To understand the fundamental concepts in automata theory and formal languages and apply them in the branches of computer science, namely compilers, software engineering and concurrent systems

**Prerequisites:** Basic Knowledge on Mathematics, algorithm, data Structures and programming

**Course Outcomes**

**CO1:** Understand the introductory concepts of formal languages of theory of computation

**CO2:** Solve regular expressions and various problems to minimize FA.

**CO3:** Apply various languages to construct context free grammar.

**CO4:** Solve various problems by applying normal form techniques

**CO5:** Understand Pushdown Automata and Turing Machine

<b>Finite Automata and Formal languages</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Introduction to Finite Automata</b>	Introduction to finite automata; The central concepts of Automata theory; Deterministic Finite automata; Nondeterministic Finite Automata, An application of finite automata; Finite automata with Epsilon-transitions	<b>10</b>
<b>II Regular Languages, Properties of Regular Languages</b>	Regular expressions; Finite Automata and Regular Expressions; Applications of Regular Expressions. Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata	<b>10</b>
<b>III Context-Free Grammars And Languages</b>	Context –free grammars; Parse trees; Applications; Ambiguity in grammars and Languages. Pushdown Automata : Definition of the Pushdown automata; The languages of a PDA; Equivalence of PDA’s and CFG’s	<b>10</b>
<b>IV Properties of Context-Free Languages</b>	Deterministic Pushdown Automata , Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFLs ; Problems that Computers cannot solve .	<b>10</b>

<b>V</b> <b>Introduction To Turing Machine</b>	The turing machine; Programming techniques for Turing machines; Extensions to the basic Turing Machines; Turing Machine and Computers. Undecidability : A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem; Other undecidable problems.	<b>12</b>
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**Text Book**

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2011.

**Reference Books**

1. Daniel I.A. Cohen: Introduction to Computer Theory, 2nd Edition, John Wiley & Sons, 2009.
2. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill, 2007.
3. A.M. Padma Reddy : Finite Automata & Formal languages, Sri Nandi publications,6th Edition, 2014

**Elective-I**  
**CA5AI:Artificial Intelligence**

52 Hours Course

Theory – 4 Hours /week

*Objective: To understand basic concepts of Artificial Intelligence*

*Prerequisites: Knowledge of algorithms*

**Course Outcomes**

**CO1:** Understand the basics of AI , AI techniques and Production characteristics

**CO2:** Ability to apply knowledge representation, reasoning, game playing and planning

**CO3:** Familiarize with natural language processing, grammars, parsing techniques, Semantic analysis and representation

**CO4:** Understand Expert systems, Rule-Based system architecture, knowledge acquisition and knowledge system

<b>Artificial Intelligence</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I AI Representation &amp; Search Techniques</b>	Introduction to Artificial Intelligence: Definition, AI Applications, AI representation, Properties of internal Representation, Heuristic search techniques. Best first search, mean and end analysis, A* and AO* Algorithm, Game Playing, Minimize search procedure, Alpha beta cutoffs	<b>10</b>
<b>II Knowledge representation</b>	Knowledge representation using predicate logic: predicate calculus, Predicate and arguments. Knowledge representation using non monotonic logic: TMS (Truth maintenance system), statistical and probabilistic reasoning, fuzzy logic, structure knowledge representation, semantic net, Frames, Script, Conceptual dependency.	<b>10</b>
<b>III Planning &amp; Perception</b>	Planning: block world, strips, Implementation using goal stack, Non linear planning with goal stacks, Hierarchical planning, list commitment strategy. Perception: Action, Robot Architecture, Vision, Texture and images, representing and recognizing scenes.	<b>10</b>
<b>IV Learning &amp; Introduction to Neural Networks</b>	Learning: Learning as induction matching algorithms. Failure driver learning, learning in general problem solving concept learning. Neural Networks: Introduction to neural networks and perception-qualitative Analysis only, neural net architecture and applications.	<b>10</b>
<b>V Natural language processing &amp; Expert System</b>	Natural language processing and understanding and pragmatic, syntactic, semantic, analysis, RTN, ATN, understanding sentences. Expert system: Utilization and functionality, architecture of expert system, knowledge representation, two case studies on expert systems.	<b>12</b>

**Text Book**

1. E. Rich and K. Knight," Artificial Intelligence", Tata McGraw Hill, 2013.
2. E. Charnaik and D. McDermott," Introduction to artificial Intelligence", Pearson Education, 2012.

**References**

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI, 30 2013
2. Nils J. Nilson, "Principles of Artificial Intelligence", Narosa Publishing Co. 2002
3. M.Timjones "Artificial Intelligence a Systems Approach" University Science Press 2010

## **CA5AJPL: Advanced Java Programming Lab**

**3 Hours /week**

<b>Section A</b>	
1	Write a program to accept a website name and return its IP address
2	Implement TCP/IP protocol for message communication
3	Implement UDP protocol for message communication
4	Demonstrate a Java swing program to create a label with image
5	Implement a program to create push buttons and draw borders around the buttons
6	Write a program to demonstrate checkboxes and radio buttons with appropriate Event handling in Java swing
7	Write a program to demonstrate the functioning of a toggle button in Java swing
8	Write a program to create a menu in Java swing
9	Write a program to create Login Dialog in Java Swing
10	Write a program to create Popup Menu in Java Swing
<b>Section B</b>	
11	Write a Java Servlet program to implement a dynamic HTML using Servlet (user name and password should be accepted using HTML and displayed using a Servlet)
12	Create a servlet that uses Cookies to store the number of times a user has visited your servlet
13	Write a JSP program to demonstrate the import attribute
14	Write a Java JSP program which uses <jsp:plugin> tag to run an applet
15	Implementation of Java Bean by making use of Introspector, Property Descriptor, Event Descriptor classes
16	Program to implement DML operations using JDBC connectivity

### **Practical Examination Question Paper Pattern**

Two questions from Section A and one question from Section B would be given by the examiner and two questions will be answered and executed by the students of their choice.

#### **Scheme of Evaluation:**

<b>Writing two Programs</b>	10 Marks
<b>Execution of Two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

## **CA5MADL :Mobile Application Development Lab**

**3 Hours /week**

<b>Sl. No</b>	<b>Exercises</b>
<b>1.</b>	Basic application.
<b>2.</b>	Implementing image view.
<b>3.</b>	Implementing Notifications
<b>4.</b>	Implementing UI layouts: a) Linear layouts      b) Relative layouts      c) Table layout
<b>5.</b>	Implementing input method editor using Keyboard
<b>6.</b>	Implementing Lists. a) List view      b) Multiple selection Mode      c) Spinner View
<b>7.</b>	Implementing menus. a) Sub menu      b) Context menu
<b>8.</b>	User manipulation of Audio.
<b>9.</b>	Implementing Location and MAP services.
<b>10.</b>	Read and write Local data.
<b>11.</b>	Usage of database activity in android application.

### **Practical Examination Question Paper Pattern**

Three Questions to be given by the examiner and two questions will be answered and executed by the students of their choice.

#### **Scheme of Evaluation :**

<b>Writing two Programs</b>	10 Marks
<b>Execution of Two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

## **CA5PR1:Project I**

Students are expected to develop an application using the techniques that they learnt during their course of study.

### **Practical Examination Question Paper Pattern**

#### **Scheme of Evaluation:**

<b>Project Demo</b>	30 Marks
<b>Viva-Voce</b>	20 Marks
<b>Add-on Module</b>	10 Marks
<b>Project Report</b>	10 Marks
<b>Total</b>	<b>70 Marks</b>



**SIXTH SEMESTER**  
**CA6DWD:Data Warehousing and Data Mining**

**52 Hours Course**

**Theory –4 Hours/week**

*Objective: To make the students understand the overall architecture of data warehouse, techniques and methods for data mining. To help the students appreciate the applications of data mining in day-to-day life.*

*Prerequisites: Knowledge on database technology and queries.*

**Course Outcomes**

**CO1:** Understand the architecture of Data Warehouse, Online Analytical Processing and the applications of Data Mining and its Challenges

**CO2:** Understand ETL data pre-processing techniques and apply it to prepare data for mining algorithms

**CO3:** Analyze association rule mining algorithms and apply it to find frequent patterns in a dataset

**CO4:** Learn classification algorithms such as Decision Tree, Naïve Bayes classifier, K-Nearest neighbor used in machine learning

**CO5:** Understand various clustering techniques to categorize the data and gain knowledge in text mining, web mining, spatial data mining and multimedia data mining

<b>Data Warehousing and Data Mining</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Data Warehouse</b>	Overview of Data Warehouse and OLAP (Online Analytical Processing) Technology – Data Warehouse Architecture -Data warehouse Implementation – From Data warehouse into Data Mining	<b>08</b>
<b>II Data Mining</b>	Data- Types of Data- Data Mining - Interestingness of patterns- Data Mining Vs. Knowledge discovery in Databases- Data Mining Functionalities – Classification of Data Mining Systems - Data Mining Task Primitives – Integration of a Data Mining system with a Database or Data Warehouse System – Data Mining Applications- Major Issues in Data Mining.	<b>10</b>
<b>III Data Preprocessing</b>	<b>Data Preprocessing:</b> Why preprocess the data? Data Cleaning, Data Integration – Data Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.	<b>10</b>
<b>IV Data Mining Techniques I</b>	<b>Data Mining Techniques: Association and Correlation-</b> Association Rule Mining - The Apriori Algorithm – Frequent Pattern Growth-Mining Multilevel Association Rules – Mining Multidimensional Association Rules <b>Classification and Prediction</b> – Issues regarding Classification and Prediction – Classification Methods :Decision Tree Induction – Bayesian Classification – Rule Based classification - Back Propagation –Prediction – Regression Methods.	<b>12</b>

<b>V</b> <b>Data Mining Techniques II &amp; Web Mining</b>	<b>Clustering</b> – Cluster Analysis – Types of data in cluster analysis - Partitioning Methods- Density Based Methods- Hierarchical Methods - Grid Based Methods <b>Mining Complex Data Types</b> -Web Mining – Text Mining – Spatial Data Mining – Multimedia Data Mining	<b>12</b>
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**Text Books**

1. Jiawei Han and Micheline Kamber , “Data Mining: Concepts and Techniques” - Morgan Kaufmann Publishers, San Francisco, USA, 2006.
2. Anand Rajaraman and Jeffrey D.Ullman – “Mining of Massive Datasets”

**Reference Book**

1. Alex Berson and Stephen J. Smith , “Data Warehousing, Data Mining & OLAP” , Tata McGraw Hill Edition, 2007.

## CA6DAA:Design and Analysis of Algorithms

**52 Hours Course**

**Theory – 4 Hours /week**

**Objective:** To create analytical skills, to design algorithms for various applications, and to analyze the algorithms for its efficiency.

**Prerequisites:** Basic Knowledge on Mathematics and Data Structures

### Course Outcomes

**CO1:** Explain fundamental concepts of algorithm design and analysis process and asymptotic notations

**CO2:** Know various algorithm design techniques

**CO3:** Apply algorithm design techniques to various problems and obtain time-complexity of various algorithms

**CO4:** Apply algorithm design techniques to graph applications

**CO5:** Understand and apply Back tracking and Branch and bound techniques to real time applications

**CO6:** Understand the fundamental concepts of P, NP and NP-Complete problems

<b>Design and Analysis of Algorithms</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Fundamentals of Algorithm Analysis</b>	<b>Introduction:</b> What is an algorithm? , Fundamentals of Algorithmic problem solving, problem types. <b>Fundamentals of the analysis of Algorithm Efficiency:</b> Analysis of framework, Asymptotic Notations and Basic efficiency classes. <b>Analysis of Simple Algorithms:</b> Maximum of given numbers, Matrix multiplication, linear search, Factorial of a number using recursion, Tower of Hanoi.	<b>10</b>
<b>II</b> <b>Algorithm Design Techniques</b>	<b>Brute Force:</b> Selection Sort, String matching problem, Travelling Salesman Problem. <b>Divide-and-Conquer:</b> Merge Sort, Quick sort, Binary Search, Matrix Multiplication, Strassen’s Matrix multiplication. <b>Decrease-and-Conquer:</b> Insertion Sort <b>Transform-and-Conquer :</b> Horner’s Rule Space and Time Tradeoffs : Sorting-by- Counting	<b>12</b>
<b>III</b> <b>Dynamic Programming</b>	<b>Dynamic Programming:</b> Computing Binomial Co-efficients, Optimal Binary Search Trees, Knapsack problem and Memory functions.	<b>10</b>
<b>IV</b> <b>Greedy Technique</b>	<b>Greedy Technique:</b> Prim’s Algorithm, Kruskal’s Algorithm, Dijkstra’s Algorithm, Huffman Trees.	<b>10</b>
<b>V</b> <b>Algorithm Power</b>	<b>Lower Bound Theory, Back Tracking:</b> n-Queens problem. <b>Branch &amp; Bound:</b> Subset-Sum Problem	<b>10</b>

**Text Book**

1. Annany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, Second Edition.

**Reference Books**

1. E. Horowitz and S. Sahani, “Fundamentals of Computer Algorithms”, Galgotia Publications.
2. Aho, Hopcraft and Ullman, “Design and Analysis of Computer Algorithms”, Addison-Wesley Series.

## CA6MA :Multimedia Applications

**52 Hours Course**

**Theory - 4 Hours /week**

**Objective:** To understand the various concepts of multimedia tools and to gain hands-on experience on multimedia applications.

**Prerequisite:** Basic knowledge of computers.

### Course Outcomes

**CO1:** Understand the principles of multimedia authoring paradigm, tools and characteristics of digital media.

**CO2:** Understand the representations of different multimedia data and different data formats.

**CO3:** Apply different compression principles, compression techniques and compression standards.

**CO4:** Use appropriate tools for editing, processing and rendering image, video, sound and animation.

<b>Multimedia Applications</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I Introduction to Multimedia</b>	<p><b>Multimedia-An overview:</b> Introduction, Multimedia presentation and production, Characteristics of a multimedia presentation, Hardware and software requirements, Uses of multimedia.</p> <p><b>Digital representation:</b> Introduction, Analog representation, Waves, Need for Digital representation.</p>	<b>10</b>
<b>II Elements of Multimedia</b>	<p><b>Text:</b> Introduction, Types of text, Unicode standard, Font, Text Compression, File formats. <b>Image:</b> Introduction, Image types, Color models, Basic steps for image processing, Color Management System (CMS), File Formats, JPEG basics. <b>Audio:</b> Introduction, Acoustics, Nature of sound waves, Fundamental characteristics of sound, Elements of Audio systems, Musical Instrument Digital Interface(MIDI), Sound card, Audio file formats and CODECs.</p> <p><b>Video:</b> Introduction, Analog video camera, Transmission of video signals, Video signal formats, Digital Video, Digital video standards, Video file formats and CODECs.</p>	<b>10</b>
<b>III Compression Techniques</b>	<p><b>Compression:</b> Introduction, Lossless Compression Techniques - Huffman Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image Compression, Lossy Compression Techniques, JPEG image compression, Audio compression, Video compression.</p>	<b>12</b>
<b>IV Introduction to Photoshop CS6</b>	<p><b>Introduction:</b> Vector and Raster Images.</p> <p><b>Basic Photo Corrections:</b> Resolution and image size, Straightening and cropping the image, Replacing colors in an image, Adjusting saturation with the Sponge tool, Repairing areas with the Clone Stamp tool, Using the Spot Healing Brush tool, About camera raw files, Applying advanced color correction, Correcting digital photographs in Photoshop. <b>Selection Tools:</b> Marquee Tool, Lasso Tool, Magic Wand</p>	<b>10</b>

	<p>Tool, Saving selection, Move, Crop, Hide a selection, Adjust the selection area, Copy and deleting the Selections, Free Transformation of the images.</p> <p><b>Layers:</b> Layers basics, Selecting, Grouping and Linking Layers, Masking Layers, Layer Opacity and Styles, Saving files.</p>	
<p><b>V</b></p> <p><b>Introduction to Flash</b></p>	<p><b>Introduction to Flash:</b> Working with library, understanding timeline, using property inspector, using panel, using tools panel, previewing your movie, modifying with content and stage, saving and publishing. Working with Graphics-Understanding strokes and fills, creating shapes, making selections, editing shapes, using gradients and bitmap fills, making patterns and decorations, creating curves, creating and editing text. Creating and editing symbols-Importing illustrator files, about symbols, creating symbols, importing Photoshop files, editing and managing symbols, changing the size and position of instance, understanding blend effects, applying filters and special effects.</p>	<p><b>10</b></p>

### Text Books

1. Ranjan Parekh, "Principles of Multimedia", McGraw-Hill Companies, Second Edition, 2013.
2. Adobe Photoshop CS6, "Adobe Photoshop CS6 Classroom in a Book"-The official training workbook from Adobe Systems, Adobe Press, 2012.
3. Adobe Flash Professional CS6, "Adobe Classroom in a Book"- The official training workbook from Adobe Systems, Adobe Press, 2012.

### Reference Book

1. Ze-Nian Li, Mark S. Drew- "Fundamentals of Multimedia, "Pearson Publications", 2006.
2. Multimedia Technology and applications, David Hillman, Galgotia publications, Reprint: 2008
3. Multimedia Literacy by Fred T Hofstetter - Third edition TMH, 2001.

**Elective – II**  
**CA6EEC :E-Commerce**

**52 Hours Course**

**Theory –4 Hours /week**

**Objective: To know the scope of e-commerce, Business strategy in Electronic Age, B2B Electronic Commerce, Internet and Extranet, Public Policy and Infrastructure of EC.**

**Prerequisites: Basic Knowledge on Internet and its resources.**

**Course Outcomes**

**CO1:** Understand the scope of e-Commerce in current business scenario

**CO2:** Understand the major types in e-Commerce business models

**CO3:** Identify different electronic payment methods and their protocols

**CO4:** Understand network structures namely Intranet, Internet and Extranet

**CO5:** Identify different legal and ethical issues concerning e-Commerce

<b>E-Commerce</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Introduction to E-Commerce</b>	<b>Introduction:</b> The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic E-commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective. <b>Business Strategy in an Electronic Age:</b> Supply Chains, Porter’s Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter’s Model, First Mover Advantage, Sustainable Competitive Advantage, Competitive Advantage using E-Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT, Technology, Business Environment, Business Capability, Exiting Business Strategy, Strategy Formulation & Implementation Planning, E-Commerce Implementation, E-Commerce Evaluation	<b>10</b>
<b>II</b> <b>Business-to-Business Electronic Commerce, Electronic Payment Systems</b>	Characteristics of B2B EC, Models of B2B EC, Integration with Back-end Information System, Electronic marketing in B2B, <b>EDI:</b> Need for EDI Standards, EDIFACT Standard, EDI Communications. <b>Electronic Payment Systems :</b> Electronic Payments & Protocols, Security Schemes in Electronic payment systems, Electronic Credit card system on the Internet, Electronic Fund transfer and Debit cards on the Internet, Stored – value Cards and E- Cash, Electronic Check Systems, Prospect of Electronic Payment Systems, Managerial Issues. Digital Signature.	<b>12</b>
<b>III</b> <b>Internet and Extranet,</b>	Architecture of the Internet, Intranet and Extranet, Intranet software, Applications of Intranets, Intranet Application Case Studies, The Extranets, The structures of Extranets, Extranet products & services, Applications of Extranets, Business Models of Extranet Applications.	<b>10</b>

<b>Public Policy</b>	<b>Legal Issues:</b> Legal, Ethical & Other Public Policy Issues, Protecting Privacy, Protecting Intellectual Property, Free speech, Internet Indecency & Censorship,	
<b>IV Digital Marketing</b>	<b>Digital Marketing:</b> Introduction to digital marketing, Important Digital Marketing Terms, Paid Media, Earned Media and Owned Media, Why Digital Marketing?, Planning a Digital Marketing Campaign, Introduction to Content Marketing, Creating a content marketing plan, Influencer Marketing, Pay-Per-Click advertising, Google Adwords & Search Engine Marketing.	<b>10</b>
<b>V Search Engine Optimization</b>	<b>Search Engine Optimization:</b> Introduction & Overview, How does Google search work, How to create an SEO Strategy, Technical SEO factors, SEO tools, Kinds of SEO, Techniques, Immune a website against Negative SEO attacks and identify bad backlinks to site, Google Analytics Dashboard	<b>10</b>

### **Text Books**

1. David Whiteley, “ E-Commerce: Strategy, Technologies and Applications”, Tata McGraw Hill, 2001,Reprint.
2. Eframi Turban, Jae Lee, David King, K. Michale Chung, “Electronic Commerce”, Pearson education, 2015.

### **Reference Book**

1. Ravi Kalakota and Andrew B Whinston, “Frontiers of Electronic Commerce”, Pearson Education, 2009, Reprint.



**Elective – II**  
**CA6NS: Network Security**

**52 Hours Course**

**Theory – 4 Hours/week**

**Objective:** To introduce the principles and practices of Network Security, encryption and authentication and help them to identify the applications of these techniques.

**Prerequisite:** Knowledge on basics of Number theory and Computer Security

**Course Outcomes**

**CO1:** Identify and classify computer and security threats and understand a security model to prevent, detect and recover from attacks.

**CO2:** Apply modern algebra and number theory to understand cryptographic algorithms

**CO3:** Understand the message authentication algorithms and techniques namely digital signatures and hash functions

**CO4:** Analyze key management and distribution using symmetric and asymmetric encryption.

**CO5:** Understand the need for Kerberos authentication and the related techniques

<b>Network Security</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Introduction</b>	<b>Computer Security:</b> Computer Security - Security Attacks - Security Services - Security Mechanisms - A Model for Network Security. IT Act- Section 43, Section 46 <b>Cryptographic Techniques:</b> Cryptography – Substitution Techniques – Transposition Techniques – Steganography – Block Ciphers and stream Ciphers – DES Encryption – DES Decryption	<b>8</b>
<b>II</b> <b>Public Key Cryptography</b>	<b>Introduction To Number Theory:</b> Prime Numbers – Fermat’s and Euler’s Theorem – Testing for primality – Chinese Remainder Theorem – Discrete Logarithm <b>Public Key Cryptography &amp; RSA:</b> Principles of public key cryptosystem – RSA – Diffie Hellman Key Exchange – Elgamel Cryptosystem.	<b>12</b>
<b>III</b> <b>Cryptographic Hash functions and applications</b>	<b>Cryptographic hash functions :</b> Cryptographic hash functions and its applications – MD5-SHA1-SHA2 <b>Message Authentication &amp; Digital Signature:</b> Message Authentication requirements – Functions – HMAC – Objective – Algorithm <b>Digital Signature:</b> Digital Signature - Digital Signature Standard Algorithm (DSS)	<b>10</b>
<b>IV</b> <b>Key Management, Distribution &amp; User Authentication</b>	<b>Key Management &amp; Distribution:</b> Symmetric-Key Distribution using symmetric and asymmetric encryption – Distribution of public key – X.509 certificates <b>User Authentication:</b> Remote user authentication - Kerberos	<b>10</b>

<b>V</b> <b>Network &amp; Internet Security</b>	<b>Web Security:</b> Web security Considerations - Secure Socket Layer - Transport layer Security <b>E-Mail Security</b> – Pretty Good Privacy, S/MIME. <b>IP Security</b> – IP Security Overview - IP Security Policy - Encapsulating Security Payload - Combining Security Associations - Internet Key Exchange Protocol.	<b>12</b>
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**Text Books**

1. William Stallings, “Cryptography and Network Security” –Prentice Hall, 5th edition, 2010.
2. Atul Kahate,“Cryptography and Network Security” –Tata McGraw - Hill, 3th edition, 2006.

**Reference Books**

1. Eric Maiwald – “Information Security Services, Fundamentals of Network Security” – DreamTech Press, 2004.
2. Michael E. Whitman and Herbert J.Mattord – “Principles of Information Security”- Thomas Cengage Delmar Learning India Pvt., 2<sup>nd</sup> Edition, 2012.

**Elective – II**  
**CA6CC: Cloud Computing**

52 Hours Course

Theory – 4 Hours/week

**Objective:** To understand cloud computing technologies, cloud services, data processing and also learn resource management in the cloud

**Prerequisite:** Basic Knowledge of computer networking and distributed computing

**Course Outcomes**

**CO1:** Understand the fundamental principles of distributed computing

**CO2:** Understand the importance of virtualization in distributed computing

**CO3:** Understand the business models that underlie Cloud Computing.

**CO4:** Understand concepts of IAAS, SASS, PAAS

<b>Cloud Computing</b>		
<b>Module</b>	<b>Description</b>	<b>Hours</b>
<b>I</b> <b>Introduction &amp; Principles of Parallel and Distributed Computing</b>	<b>Introduction:</b> The vision of cloud computing, Defining a cloud, The cloud computing reference model, Characteristics and benefits. Historical developments: Distributed systems, Virtualization, Service-oriented computing, Utility-oriented computing. Building cloud computing environments <b>Principles of Parallel and Distributed Computing:</b> Parallel vs. distributed computing, Elements of parallel & distributed computing, Technologies for distributed computing	<b>10</b>
<b>II</b> <b>Virtualization</b>	<b>Virtualization:</b> Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology example: VMware: full virtualization	<b>10</b>
<b>III</b> <b>Cloud Computing Architecture &amp; Concurrent Computing</b>	<b>Cloud Computing Architecture:</b> The cloud reference model, Types of clouds, Challenges. <b>Concurrent Computing :</b> Anatomy of the Aneka container , Introducing parallelism for single-machine computation , Programming applications with threads , Multithreading with aneka , Programming applications with aneka threads. <b>Cloud computing economics:</b> Cloud infrastructure , Economics of private clouds , Software productivity in the cloud , Economies of scale: public vs. private clouds.	<b>10</b>
<b>IV</b> <b>Multi-tenant software &amp; Data in the Cloud</b>	<b>Multi-tenant software:</b> Multi-entity support - Multi-schema approach - Multi-tenancy using cloud data stores - Data access control for enterprise applications. <b>Data in the cloud:</b> Relational databases - Cloud file systems: GFS and HDFS - BigTable, HBase - Cloud data stores: Datastore and SimpleDB	
<b>V</b> <b>Applications</b>	<b>Cloud Platforms in Industry:</b> Amazon web services, Google AppEngine, Microsoft Azure. <b>Cloud Applications:</b> Scientific applications, Business and consumer applications	<b>12</b>

**Text books**

1. Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, “Mastering Cloud Computing” - Foundations and Applications Programming , MK publications, 2013.

**Reference Books**

1. Michael J.Kavis, “Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)”, John Wiley & Sons Inc., Jan 2014.
2. Gautam Shroff, “Enterprise Cloud Computing: Technology, Architecture, Applications” Cambridge University Press, 2010.

**CA6DAL : Data Mining & Data Analytics Lab**

**3 Hrs/Week**

Sl. No	Exercises
	<b>Section A- Working with R tool</b>
1	Arrays and Vectors
2	Lists
3	Data Interfaces – CSV, Excel, Binary Files
4	Data Exploration – Descriptive and Dispersion measures.
5	Data Visualization
	<b>Section B-Data Mining Techniques</b>
6	Data Preprocessing
7	Regression techniques (Linear, Multiple, Nonlinear and Logistic)
8	Classification techniques (Naïve Bayes Classifier, Decision trees, K-Nearest Neighbor)
9	Clustering (Partitioning clustering, Hierarchical Clustering, Density-based)

**Practical Examination Question Paper Pattern**

Three questions will be given by the examiner and two questions will be answered and executed by the students of their choice.

**Scheme of Evaluation:**

<b>Writing two Programs</b>	10 Marks
<b>Execution of Two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

## **CA6MAL:Multimedia Applications Lab**

**3 Hours /week**

<b>Sl. No</b>	<b>Exercises</b>
1	Perform audio editing tasks
2	Perform video editing tasks
3	Create a movie to implement remix of graphics, text, audio and video clips
<b>Photoshop</b>	
4	Working with image selection tools
5	Working with image and color basics
6	Working with image adjustments ( Clone and Healing tools)
7	Working with layers
8	Demonstrate the use of drawing and painting tools.
9	Working with Type tool and its effects
10	Working with filters
<b>Flash</b>	
11	Demonstrate Motion Tweening
12	Demonstrate Shape Tweening
13	Demonstrate Masking Effect
14	Demonstrate Ripple Effect
15	Demonstrate Sparkling Glass Effect
16	Create 2D-animation : <ul style="list-style-type: none"><li>❖ Cartoon</li><li>❖ Bouncing ball</li><li>❖ Growing moon</li><li>❖ Simulating rain</li></ul>

### **Practical Examination Question Paper Pattern**

Three questions will be given by the examiner and two questions will be answered and executed by the students of their choice.

#### **Scheme of Evaluation:**

<b>Writing two Programs</b>	10 Marks
<b>Execution of Two programs</b>	15 Marks
<b>Viva-Voce</b>	05 Marks
<b>Record</b>	05 Marks
<b>Total</b>	<b>35 Marks</b>

## **CA6PR2: Project II**

Students are expected to develop an application using the techniques that they learnt during their course of study.

### **Practical Examination Question Paper Pattern**

#### **Scheme of Evaluation:**

<b>Project Demo</b>	75 Marks
<b>Viva-Voce</b>	35 Marks
<b>Add-on Module</b>	15 Marks
<b>Project Report</b>	25 Marks
<b>Total</b>	<b>150 Marks</b>

**THIRD SEMESTER**  
**Interdisciplinary Course**  
**Multimedia Authoring Tools**

**26 Hours Course: Theory - 2 Hours /week**

**Objective** : To combine video, audio, images and texts into one synchronized learning object using Multimedia tools

**Prerequisite** : Basic Knowledge of Computers

**Learning Outcome** : To prepare small animated demo packages and promotion videos.

**Target Group** : Non Computer Science Students

<p><b><u>Unit I</u></b>  <b>Exploring Photoshop</b></p>	<p><b>Exploring Photoshop Menu bar</b> :File, Edit, Image, Layer, Select, Filter, View, Understanding 3D menu, Window menu, Exploring Panels, Exploring Tools in Tool box.  <b>Working with Images</b> :Creating and Opening Images, Resizing Files and Adjusting Resolution, Changing Canvas size, Straightening and Cropping Images.  <b>Understanding Colors, Histograms, Levels and Curves:</b> Knowing Color Basics, Understanding Histograms, Adjusting Images with Histogram Tools, Adjusting levels with Curves Tools, Working with different Color Modes.  <b>Selection Tools</b> :Marquee Tools, Lasso Tools, Quick Selection Tools, Adjusting Selection, Refining edges  <b>Working with layers</b> :Understanding Multiple Layers, Adding New Layer, Layer Panel, Blending Modes, Linking and Grouping layers, Creating Layer Style Special effects, Manipulating Layer Masks, Editing Masks, Merging layers.</p>	<p><b>10 hrs</b></p>
<p><b><u>Unit II</u></b>  <b>Getting started with Flash &amp; Working with Animation</b></p>	<p><b>Introduction to Flash</b> : Opening a File, Knowing Workspace, Working with Library panel, Understanding Timeline, Previewing Movie, Modifying content and stage, Saving and Publishing Movie.  <b>Working with Graphics</b> :Understanding strokes and Fills, Creating Shapes, Making Selection, Editing Shapes, Using Gradient and Bitmap Fills, Making Patterns and Decorations, Creating Curves, Transparencies  <b>Creating &amp; Editing Symbols</b> :Editing and managing symbols, Importing Photoshop files, Understanding Display options, Applying Filters for Special effects.  <b>Adding Animation</b> : Animating Position, Changing Pacing and Timing, Animating Transparency, Filters, Transformations, Animating 3D Motion.</p>	<p><b>10 hrs</b></p>
<p><b><u>Unit III</u></b>  <b>Creating Interactive Navigation &amp; Working with Text</b></p>	<p><b>Understanding Action Script</b> :Creating interactive movies, creating buttons, understanding timeline, Creating Event handler for buttons, Creating Home button with code snippets, Animated buttons  <b>Working with Text</b> : Adding simple text, Adding multiple columns, Wrapping text, Hyperlinking Text, Creating User-Input Text.</p>	<p><b>6 hrs</b></p>



**Text Books**

1. Danae Dayley, Brad Dayley – “Adobe Photoshop-CS6 Bible”, John Wiley Publications, 2012
2. Adobe Creative Team - Adobe Flash Professional CS6 Classroom in a book, Pearson Education,2012

**Reference Books**

1. Elaine Weinmann, Peter Lourekas- “Visual Quick Start Guide-Photoshop CS6, Peachpit Press, 2012 Edition
2. Robert Reinhardt, Snow Dowd-“ Adobe Flash CS4 Professional Bible “, Wiley Publications, 2009 Edition.

**FOURTH SEMESTER**  
**Skill Enhancement Course**  
**Python Programming**

**26 Hours Course: Theory –2 Hours /week**

**Objective: To gain knowledge in writing python scripts and also to explore python's object oriented features.**

**Prerequisites: Knowledge in Programming**

<b>Python Programming</b>		
<b><u>Unit I</u></b>  <b>Basics, Control Structures &amp; Other Features</b>	<b>Python Basics:</b> First Python Script, Basic Data Types, Identifiers, Keywords, Variables, Basic Input and Output. <b>Python Control Structures:</b> Decisions, Loops, Terminating Control. <b>Lists:</b> Creating, Accessing & Counting List elements, List Slices, Adding and Deleting elements <b>Tuples:</b> Creating Tuples, Accessing, Counting and Iterating through tuple elements, Searching elements, Tuple Slices. <b>Dictionaries:</b> Creating Dictionaries, Accessing, Counting and Iterating through dictionary elements, Searching elements.	<b>6 hrs</b>
<b><u>Unit II</u></b>  <b>Strings , Functions &amp; Practical Python</b>	<b>Strings:</b> Search, Split, Join, Modify, Replace operations. <b>Functions:</b> Definition, Function Call, Positional Arguments, Default, Keyword and Variable Arguments, Returning from Functions, Returning Single Values and Collections from Functions. <b>Practical Python:</b> map(), filter() and reduce() functions	<b>5 hrs</b>
<b><u>Unit III</u></b>  <b>Object Oriented Programming in Python</b>	<b>OOP in Python:</b> Overview of OOP Principles, Defining class, Instantiating class, Instance Variables and Class Variables, Constructors and Destructors, Private, Public and Protected members <b>Inheritance:</b> Simple Inheritance, Function Overriding, Multiple Inheritance <b>Dynamic Polymorphism:</b> Abstract Methods and Classes	<b>15 hrs</b>

**Text Book**

1. B. Nagesh Rao, " Learning Python", CyberPlus Infotech Pvt.Ltd, 2017

**Reference Books**

1. Allen B. Downey, "Think Python", O' Reilly Media Inc; 2016
2. Matic C.Brown, "The Complete Reference Python", M.C.Graw Hill Education, 2001.