

M. C. A.
(COMPUTER APPLICATIONS)
SYLLABUS - 2017

SCHOOLS OF EXCELLENCE
with
CHOICE BASED CREDIT SYSTEM (CBCS)



SCHOOL OF COMPUTING SCIENCES
St. JOSEPH'S COLLEGE (Autonomous)

Special Heritage Status Awarded by UGC
Accredited at 'A' Grade (3rd cycle) by NAAC
College with Potential for Excellence Conferred by UGC
DBT-STAR & DST-FIST Sponsored College
TIRUCHIRAPPALLI - 620 002, INDIA

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)

POSTGRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to work towards academic excellence. In this regard, it has initiated the implementation of "Schools of Excellence" from the academic year 2014-15, to standup to the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system allows enhanced academic mobility and enriched employability of the students. At the same time the system preserves the identity, autonomy and uniqueness of every department and reinforces their efforts to be student-centric in curriculum designing and skill imparting. These five schools will work concertedly to achieve and accomplish the following objectives.

- Optimal utilization of resources - both human and material for the academic flexibility leading to excellence.
- Students experience their choice of courses and credits for their horizontal mobility.
- The existing curricular structure as specified by TANSCHÉ and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice based credit system.
- Human excellence in specialized areas.
- Thrust in internship and / or projects as a lead towards research, and
- The **multi-discipline** nature of the newly evolved structure (School System) caters to the needs of the stake-holders, especially the employers.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The following table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For PG courses, a student must earn a minimum of 150 credits as mentioned in the table below. The total number of minimum courses offered by a department are given in the course pattern.

SUMMARY OF HOURS AND CREDITS PG COURSES - MASTER OF COMPUTER APPLICATIONS (MCA)

Part	Semester	Specification	No. of Courses	Hours	Credits	Total Credits
1	I-IV	Core Courses				121
		Theory	23	80	59	
	Practical	11	32	20		
	II	Self Paced Learning	1	-	2	
III	IV	Common Core	3	12	10	
		Comprehensive Examination	1	2	2	
		Project Work	1	30	20	
2	III-IV	Core Electives	3	12	12	12
3	I-III	IDC (WS)	1	4	4	12
		IDC (Common)	1	4	4	
		IDC (BS)	1	4	4	
4	I-IV	Additional Core Courses for Extra Credits	-	-	-	(9)
5	IV	SHEPHERD & Gender Studies	1	-	5	5
		TOTAL		180		150

IDC : Inter Departmental Courses

BS : Between School

WS : Within School

However, there could be some flexibility because of practicals, field visits, tutorials and nature of project work. For PG courses a student must earn a minimum of 110 credits. The total number of courses offered by a department is given above. However within their working hours few departments / School can offer extra credit courses.

Course Pattern

The post Graduate degree course consists of five vital components. They are core course, core electives, additional core course, IDCs and SHEPHERD. Additional core course are purely optional on the part of the student. SHEPHERD, the extension components are mandatory.

Core Course

A core course is the course offered by the parent department related to the major subjects, components like theories, practicals, self pace learning,

common cor, comprehensive examinations, projects and library record form part of the core courses.

Core Elective

the core elective course is also offered by the parent department. the objective is to provide choice and flexibility within the school. there are three core electives.it is offered in different semester according to the choice of the school.

Inter Departmental Course (IDC)

IDC is an interdepartmental course offered by a department / school for the students belongings to other departments/school. The objective is to provide mobility and flexibility outside the parent department/ school. this is introduced to make every course multi- disciplinary in nature. It is to be chosen from a list of courses offered by various departments.

There are three IDC's. Among three, one is the Soft-Skill course offered by the JASS in the II Semester for the students of all the Departments. The other one is offered "With-in the school" (WS) and the third one is offered "Between the school" (BS). The IDC's are of application oriented and inter disciplinary in nature.

Subject Code Fixation

The following code system (9 characters) is adopted for Post Graduate courses:

17	PXX	X	X	XX
↓	↓	↓	↓	↓
Year of Revision	PG Code of the Dept	Semester	Specification of Part	Runing number in the part
17	PCA	1	1	01

For Example :

IMCA, first semester 'UNIX' and 'C' Programming

The code of the paper is **17PCA1101**.

Thus, the subject code is fixed for other subjects.

Specification of the Part

1. Core Courses: (Theory, Practical, Self paced Learning, Common Core, Comprehensive Examination, Dissertation and Viva-voce)
2. Core Electives
3. Additional Core Courses (if any)
4. Inter Departmental Courses (WS, Soft Skill & BS)
5. SHEPHERD & Gender Studies

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks	
Passing Minimum: 50 Marks	
Library Referencing	5
3 Components	35
Mid-Semester Test	30
End-Semester Test	30
CIA	100

MID-SEM & END-SEM TEST

Centralised – Conducted by the office of COE

1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective + Descriptive elements; with the existing question pattern PART-A; PART-B; and PART-C
2. CIA Component III for UG & PG will be of 15 marks and compulsorily objective multiple choice question type.
3. The CIA Component III must be conducted by the department / faculty concerned at a suitable computer centres.
4. The 10 marks of PART-A of Mid-Sem and End-Sem Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS; TRUE / FALSE; and FILL-IN BLANKS.
5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.

SEMESTER EXAMINATION

Testing with Objective and Descriptive questions

Part-A: 30 Marks

Objective MCQs only

Answers are to be marked on OMR score-sheet. The OMR score-sheets will be supplied along with the Main Answer Book. 40 minutes after the start of the examination the OMR score-sheets will be collected

Part-B + C = 70 Marks

Descriptive

Part-B: 5 x 5 = 25 marks; inbuilt choice;

Part-C: 3 x 15 = 45 marks; 3 out of 5 questions, open choice.

The Accounts Paper of Commerce will have

Part-A: Objective = 25

Part-B: 25 x 3 = 75 marks.

Duration of Examination must be rational; proportional to teaching hours
90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

Qualitative Assessment	Grade Points	Grade	Mark Range (%)
Exemplary	10	S	90 & above
Outstanding	9	A+	85-89.99
Excellent	8	A	80-84.99
Very Good	7	B	70-79.99
Good	6	C	60-69.99
Pass (PG)	5	D	50-59.99
Reappear (PG)	0	RA	<50

EVALUATION

Percentage Marks, Grades & Grade Points

CGPA - Calculation

Grade Point Average for a semester is calculated as indicated here under:

$$\frac{\text{Sum total of weighted Grade Points}}{\text{Sum of Credits}}$$

Weighted Grade Points is **Grade points x Course Credits**. The final CGPA will only include: Core, Core Electives & IDCs.

A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.

POSTGRADUATE		
CLASS	Mark Range (%)	
	ARTS	SCIENCES
Distinction	75 & above, first attempt	80 & above, first attempt
First	60 - 74.99	60 - 79.99
Second	50 - 59.99	50 - 59.99

Declaration of Result:

Mr./ MS. _____ has successfully completed the Post Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) is _____ and the class secured is _____ by completing the minimum of 150 credits.

The candidate has acquired _____ (if any) more credits from SHEPHERD / AICUF/ FINE ARTS / SPORTS & GAMES / NCC / NSS / NATURE CLUB, ETC. The candidate has also acquired _____ (if any) extra credits offered by the parent department courses.

**Master of Computer Applications (MCA)
Course Pattern - 2017 Set**

Sem.	Code	Course	Hrs	Crs
I	17PCA1101	Unix and C Programming	6	5
	17PCA1102	Mathematical Foundations	6	5
	17PCA1103	Organisational Behaviour	6	4
	17PCA1104	Digital Computer Fundamentals	6	5
	17PCA1105	Software Lab-I(C Programming)	3	2
	17PCA1106	Software Lab-II (Multimedia)	3	2
	17PCA1107	<i>Self-paced Learning (Fundamentals of IT)</i>	-	2
	Total for Semester I			30
II	17PCA2108	Object Oriented Concepts and C++	4	3
	17PCA2109	Operating Systems	4	3
	17PCA2110	Probability and Statistics	4	4
	17PCA2111	Software Lab-III(C++)	3	2
	17PCA2112	Software Lab-IV(Unix and Shell Programming)	3	2
	17PCA2201A	Core Elective I: Python OR	4	4
	17PCA2201B	Core Elective I: Computer Simulation		
	17PSS2401	IDC: Soft Skills	4	4
	17PCA2401	IDC (WS): Data Analysis using R Language	4	4
	16PMA2401	IDC (WS): MATLAB		
16SCS2401	IDC (WS): Pervasive and Adhoc Network			
Total for Semester II			30	26
III	17SCS3101	Programming in Java	4	3
	17SCS3102	Database Systems	4	3
	17SCS3103	Design and Analysis of Algorithms	4	3
	17PCA3113	Software Lab - V (JAVA)	3	2
	17PCA3114	Software Lab-VI (RDBMS)	3	2
	17PCA3202A	Core Elective II: Computer Organization and Architecture (OR)	4	4
	17PCA3202B	Core Elective II: ERP		
	17PCA3402	IDC (BS): Web Design	4	4
	17PCA3115	Online Course - I: Quantitative Aptitude*	4	2
Total for Semester III			30	23

Sem.	Code	Course	Hrs	Crs	
IV	17PCA4116	Programming Smart Devices	5	4	
	17PCA4117	Accounting and Financial Management	5	4	
	17PCA4118	Graph and Automata Theory	5	4	
	17PCA4119	Computer Networks and Security	5	3	
	17PCA4120	Software Lab-VII(XML & Android)	3	2	
	17PCA4121	Software Lab-VIII(PHP & MySQL)	3	2	
	17PCA4203A	Core Elective III: Data Mining Techniques OR	4	4	
	17PCA4203B	Core Elective III: Information Storage and Management			
	17PCA4122	Domain Study**	-	2	
Total for Semester IV			30	25	
V	17PCA5123	Distributed Technologies	4	3	
	17PCA5124	Software Engineering	4	3	
	17PCA5125	Big data and Cloud Computing	4	3	
	17PCA5126	Operations Research	4	3	
	17PCA5127	Compiler Design	4	3	
	17PCA5128	Software Lab-IX(Distributed Programming)	3	2	
	17PCA5129	Software Lab-X (R Programming)	3	2	
	17PCA5130	Comprehensive Examination	-	2	
	17PCA5131	Mini Project**	-	3	
	17PCA5132	Online Course - II: Interview Preparation & Managerial Skills	4	2	
	Total for Semester V			30	26
	VI	17PCA6133	Project	30	20
	Total for Semester VI			30	20
I - V	17PCW6501	Community Service Work (SHEPHERD) and Gender Studies		5	
Total for all Semesters			180	150	

Semester I
17PCA1101

Hours/Week: 6
Credits : 5

'UNIX' and 'C' PROGRAMMING

Assurance of Learning:

- * To develop good understanding of the structure of UNIX operating system.
- * To develop programming skills using 'C' language
- * To know the special features of 'C' language for programming.

Unit-I (12 hours)

Structure of UNIX - UNIX file system - Types of users, files and permission - Structure of Password file - Directories and Path name - Basic directory Commands - standard I/O files - redirecting standard I/O files - Pipelines and filters.

Unit-II (12 hours)

Data Types - Variables - Operators - Control structures - Looping structures - Arrays - Strings.

Unit-III (12 hours)

Functions - Built-in-functions - Types of functions - Scope of Variables - Call by value and Call by reference.

Unit-IV (12 hours)

Pointers-Pointer and Arrays-Array of Pointers-Pointer as Function Arguments-Functions returning pointers-Pointer to Functions-Pointer and structures.

Unit-V (12 hours)

Structure - Union- Files - Sequential Files - Random Access Files - Command Line Arguments.

Books for Study

1. Rebecca Thomas, Jean Yates, "A User Guide to the UNIX System", Osborne McGraw-Hill, USA, Second Edition, 1985.
2. E.Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, New Delhi, Seventh Edition, 2016. (Unit II, III, IV, V)

Books for Reference

1. Sumitabha Das, "Unix Concepts and Applications", Tata McGraw Hill, New Delhi, Fourth Edition, 2006.

2. Byron Gottfried, "Programming with C", Schaum's Outline Series, Tata McGraw Hill Edition, New Delhi, 1991.
3. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall of India Pvt. Ltd., New Delhi, 1989.
4. T. Jeyapooan, "A First Course in Programming with C", Vikas Publishing House Pvt. Ltd., First Edition, 2002.

Sem. I
17PCA1102

Hours/Week: 4
Credits: 3

MATHEMATICAL FOUNDATIONS

Assurance of Learning

- * To give the fundamental ideas of Mathematical Logic
- * To Study the basic concepts in Set Theory, Ideas of Lattices and Boolean algebra
- * To give the basics of Numerical Methods in solving

Unit-I: (12 hours)

Mathematical Logic: Statements and Notation - Connectives - Statement Formulas and Truth Tables - Tautologies - Equivalence of Formulas - Duality Law. Tautological implications - Theory of inference - validity using truth tables-Rules of Inference.

Unit-II: (12 hours)

Basic concepts of Set Theory : Inclusion and Equality of sets - Power set - Operations on Sets - Venn Diagrams - Cartesian Products. Relations and Ordering - Binary & Equivalence relations - Partial Ordering. Functions Composition of functions, inverse functions, Binary & n-ary operations.

Unit-III: (12 hours)

Lattices as Partially ordered sets - Hasse diagrams - Properties of Lattices Distributive & Modular inequalities-Special lattices -Complete, Bounded, Complemented & Distributive lattices. Properties of Boolean Algebra.

Unit-IV: (12 hours)

Solution of polynomial equations: Birge-Vieta and Root squaring methods. System of linear algebraic equations: Gauss - elimination, Gauss - Jordan, Triangularization, Jacobi, Gauss-Seidal iterative methods.

Unit-V: (12 hours)

Interpolation: Lagrange's and Newton's interpolation - interpolating

polynomials using finite difference. Numerical integration: Trapezoidal, Simpson's rules and Romberg integration.

Note:

Stress on solving Numerical Problems in Units IV and V

Books for Study

Units I, II, III

1. J.P.Tremblay & R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw-Hill International Edition, 2008.

Units IV, V

2. M.K.Jain, S.R.K.Iyengar & R.K. Jain, "Numerical Methods for Scientific and Engineering Computation", Wiley Eastern Limited, New Delhi, 2003.

Books for Reference

1. Bernard Kolman & Robert C. Busy by, "Discrete Mathematical Structures for Computer Science", Prentice Hall of India, New Delhi, 1987.
2. S.S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall of India, New Delhi, 2005.

Sem. I

17PCA1103

Hours/Week: 4

Credits: 3

ORGANISATONAL BEHAVIOUR

Assurance of Learning

- * To familiarize the students to understand the basic concepts of organizational Structure and its behavior.
- * To equip the student in building the perceptual interpretation.
- * To acquire knowledge and capability to develop communication skills.
- * To impart the knowledge about Organizational Structure.

Unit-I: (12 hours)

NATURE OF ORGANIZATION - features - types - goals.

NATURE OF ORGANIZATIONAL BEHAVIOR - Nature of OB - Role of OB - Foundations of OB.

Unit-II: (12 hours)

NATURE OF HUMAN BEHAVIOR: Nature and causes of individual differences - models of man.

PERCEPTION: concept - process - perceptual selectivity and distortion - Developing perceptual skills.

ATTITUDES: Concept - Theories - Formation factors - measurements - Attitude change.

Unit-III: (12 hours)

MOTIVATION: Definition - Motivation & Behavior - Theories - approaches - incentives.

INTERPERSONAL BEHAVIOR: Transactional analysis - Ego states - life scripts - life positions - transactions - stroking - Psychological games - Benefits of TA.

Unit-IV: (12 hours)

GROUP DYNAMICS: Concepts & features of group - types of groups - group behavior - group decision making - committee - task group - inter group behavior.

LEADERSHIP: Definitions - types - importance theories - styles.

COMMUNICATION: Basics of communication - Communication network - Factors affecting communication - Business writing - Office management - Presentation strategies.

Unit-V: (12 hours)

ORGANIZATION THEORY: Classical organizational theory - neoclassical organization theory

DESIGNING OF ORGANIZATIONAL STRUCTURE: need - planning and process - Departmentation Span of management - delegation of authorities - centralization & decentralization

FORMS OF ORGANIZATIONAL STRUCTURES: line and staff - functional - divisional - project - matrix - free form.

Book for study

1. Prasad LM, "Organisational Behavior", Sultan Chand and Sons, 2014.

Books for Reference

1. S.S. Khanka, "Organisational Behavior", S. Chand Ltd.
2. K. Aswathappa, "Organisational Behavior", Himalaya Publishing house

Sem. I
17PCA1105

Hours/Week: 4
Credits: 3

DIGITAL COMPUTER FUNDAMENTALS

Assurance of Learning

- * To learn and understand the Fundamentals of Digital Computer Concepts.
- * To inculcate the basic knowledge of Digital Logic and Data-Processing Circuits.
- * To impart the students with Registers, counters, A/D and D/A converters and semiconductor memories.

Unit-I: (12 hours)

Digital Logic: The Basic Gates - NOT, OR, AND - Universal Logic Gates- NOR, NAND -AND-OR-Invert Gates. Combinational Logic Circuits: Boolean Laws and Theorems - Sum-of-Products Method - Truth Table to Karnaugh Map - Pairs, Quads, and Octets - Karnaugh Simplifications - Don't-care Conditions - Product-of-sums Method - Product-of-sums Simplification.

Unit-II: (12 hours)

Data-Processing Circuits: Multiplexers - Demultiplexers - 1-of-16 Decoder - BCD-to-decimal Decoders - Seven-segment Decoders - Encoders - Exclusive-OR Gates. Number Systems and Codes: Binary Number System - Binary-to-decimal Conversion - Decimal-to-binary Conversion- Octal Numbers - Hexadecimal Numbers - The ASCII Code - The Excess-3 Code - The Gray Code.

Unit-III: (12 hours)

Arithmetic Circuits: Binary Addition - Binary Subtraction - Unsigned Binary Numbers - Sign-magnitude Numbers - 2's Complement Representation - 2's Complement Arithmetic- Arithmetic Building Blocks - The Adder-subtractor - Arithmetic Logic Unit - Binary Multiplication and Division. Flip-Flops: RS FLIP-FLOPs - Gated FLIP-FLOPs - Edge-triggered RS FLIP-FLOPs - Edge-triggered D FLIP-FLOPs - Edge-triggered JK FLIP-FLOPs - JK Master-slave FLIP-FLOPs.

Unit-IV: (12 hours)

Registers: Types of Registers - Serial In-serial Out - Serial In-parallel Out - Parallel In-serial Out - Parallel In-parallel Out - Universal Shift Register - Applications of Shift Registers. Counters: Asynchronous Counters - Decoding Gates - Synchronous Counters.

Unit-V: (12 hours)

Memory: Basic Terms and Ideas - Magnetic Memory - Optical Memory - Memory Addressing - ROMs, PROMs, and EPROMs - RAMs - Virtual Memory - Cache Memory.

Books for Study

1. Donald P. Leach and Albert Paul Malvino, "Digital Principles and Application", Seventh Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2011.

Books for Reference

1. Thomas C. Bartee, "Digital Computer Fundamentals", McGraw-Hill International Edition, New Delhi, 1985.
2. Morris Mano and Michael D. Ciletti, "Digital Design", 4th Edition, Pearson publications, 2008.

Sem. I
17PCA1105

Hours/Week: 3
Credits: 2

Software Lab-I **'C' PROGRAMMING**

1. Usage of UNIX Commands
 2. Simple problems using Operators
 3. Control structures (if-else, switch-case)
 4. Looping structures (for, while, do-while)
 5. Sorting and Searching using one dimensional array
 6. Matrix operations.
 7. Recursion - Factorial, GCD, Adding two numbers
 8. String Manipulation using pointers
 9. Pointers and Structures.
 10. Structure, nested structure, structure array
 11. File Handling (Text file, Sequential and Random)
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Sem. I
17PCA1106

Hours/Week: 3
Credits: 2

**Software Lab–II
(UNIX AND SHELL PROGRAMMING)**

1. Use of Basic UNIX Shell Commands: ls, mkdir, rmdir, cd, cat, touch, file, wc, sort, cut, grep
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script exercises based on following:
 - (i) Interactive shell scripts
 - (ii) Positional parameters
 - (iii) Arithmetic
 - (iv) if-then-fi, if-then- else-fi, nested if-else
 - (v) Logical operators
 - (vi) else + if equals elif, case structure
 - (vii) while, until, for loops, use of break
4. Write a shell script to create a file.
 - (i) Input a page profile to yourself, copy it into other existing file;
 - (ii) Start printing file at certain line
 - (iii) Print all the difference between two file, copy the two files.
 - (iv) Print lines matching certain word pattern.
5. Write shell script for-
 - (i) Showing the count of users logged in,
 - (ii) Printing Column list of files in your home directory
6. Write a shell script to print files names in a directory showing date of creation & serial number of the file.
7. Write a shell script to count lines, words and characters in its input
8. Write a shell script to compute gcd lcm & of two numbers. Use the basic function to find gcd & LCM of N numbers.
9. Write a shell script to find whether a given number is prime. Take a large number such as 15 digits or higher and use a proper algorithm.
10. Write a shell script to sum series such as sine, cosine etc.

Sem. I
17PCA1107

Hours/Week: 3
Credits: 2

**Self Paced Learning
FUNDAMENTALS OF I.T.**

Assurance of learning

* To impart the knowledge about various facets of Information Technology.

Unit-I:

Information Technology - Meaning - Need - Components Role of IT - IT in manufacturing, IT in mobile computing, IT in public sector, IT in defense, IT in media, IT in publication, IT and internet. Emerging trends in IT - E-Commerce, IT and supply chain management, IT and SIS, Electronic Data Interchange (EDI).

Unit-II:

Emerging Trends of Information Technology: Mobile Communication, Bluetooth, Global Positioning System (GPS), Infrared Communication, Smart Card, Blue Laser Disc, Nano Technology, DNA Computing, Quantum Computer, Holographic Memory.

Unit-III:

Internet: Introduction, Relays, Repeaters, Bridges, Routers, Gateways. Internetworking: How networks differ, concatenated virtual circuits, connectionless internetworking, tunneling, internetwork Routing, fragmentation, Firewalls, internet architecture.

Unit-IV:

Multimedia: Definition - Building blocks of multimedia - Multimedia System - Applications - Virtual Reality. Internet Tools: Introduction - Web Browser - Electronic Mail - Search Engines - Instant Messaging.

Unit-V:

Computer in Business: Computers in Office Automation - Computers in Transaction Processing - Computers as Information Tools for Management Control - Computers in Engineering - Business on the Internet. Software Packages: Introduction to Word Processing - Microsoft Word - Desktop Publishing - Database Management Systems- Electronic Spreadsheets.

Books for Study

Unit I, II, III, IV

1. ITL Education Solution Ltd, "Introduction to Information Technology", Dorling Kindersley (India) Pvt. Ltd, New Delhi.

Unit V:

- Leon, "Introduction to computers", Vikas Publishing House Pvt. Ltd., New Delhi, 2006. (CH 10 and CH 13)

Books for Reference

- Efraim Turban et al, "Introduction to Information Technology", Wiley India Pvt. Ltd., New Delhi.
- Srinivasa Vallaban SV, (2005), Computers in Business, Sultan Chand and Sons, New Delhi.

Sem. II
17PCA2110

Hours/Week: 4
Credits: 3

OBJECT ORIENTED CONCEPTS AND 'C++'

Assurance of Learning

- * To provide a sound understanding of the basic concepts of OOPs.
- * To equip the students with the knowledge of classes and objects.
- * To make the students to Use memory appropriately, including proper allocation / deallocation procedures
- * To get a clear understanding of files and error handling concepts
- * To enrich the students with the ability to implement features of object oriented programming to solve real world problems.

Unit-I: (12 hours)

Principles of Object Oriented Programming: Procedure oriented programming - Object oriented programming paradigm - basic concepts and benefits of OOP - applications of OOP - structure of C++ - applications of C++ - operators and manipulators in C++- type cast operator.

Unit-II: (12 hours)

Functions in C++ : Function prototyping - call by reference - return by reference - inline functions - default, const arguments - function overloading - Classes and Objects: member functions - nesting of member functions - private member functions - memory allocations for objects - static data members - static member functions - arrays of objects - objects as function arguments - friendly functions - pointers to members.

Unit-III: (12 hours)

Constructors: Parameterized constructors - multiple constructors - constructor with default parameters - copy and dynamic constructors -

destructors - operator overloading - overloading unary and binary operators - overloading binary operators using friend functions.

Unit-IV: (12 hours)

Inheritance: Defining derived classes - single inheritance -making a private member inheritable - multilevel inheritance - multiple inheritance - hybrid inheritance - virtual method - pure virtual method - virtual base classes - abstract classes - constructors in derived classes - member classes: nesting of classes.

Unit-V: (12 hours)

Streams formatted and unformatted I/O: Defined manipulators - File I/O - reading and writing - various functions - Exception handling: try - throw - catch statements - re-throwing - Templates: Generic classes and functions.

Books for Study

- E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill, New Delhi, 6th edition , 2013

Books for Reference

- Robert Lafore, "Object Oriented programming in Microsoft C++", Galgotia Publications, New Delhi, 2000
- Bjarne Stroustrup, "The C++ Programming Language", Addison-Wesley, 1999.
- Herbert Schildt, "C++: The complete reference", Tata McGraw Hill, New Delhi, Second edition, 1998.

Sem. II
17PCA2111

Hours/Week: 4
Credits: 3

OPERATING SYSTEMS

Assurance of Learning:

- To understand the services provided by the OS and the design of an operating system.
- To understand the structure and organization of the file system.
- To understand what a process is and how processes are synchronized and scheduled.
- To understand different approaches to memory management.
- Students should be able to use system calls for managing processes, memory and the file system.

Unit-I: (12 hours)

Introduction: Operating System - Multiprocessor Systems - Distributed Systems- Real –Time Systems. Computer- System Structures: Computer-System Operation- I/ O structure- Storage Structure - Hardware Protection . Operating System Structure : System Components- Operating –System Services –System Calls - System Programs - System Structure.

Unit-II: (12 hours)

Process Management: Processes : Process concept - Process Scheduling - Operations on Processes - Cooperating Processes - Inter Process Communication.CPU Scheduling : Basic Concepts - Scheduling Criteria - Scheduling Algorithms- Multi- Processor Scheduling - Real-Time Scheduling. Process Synchronization: Background - The Critical-Section Problem - Synchronization Hardware- Semaphores. Deadlocks: System model – deadlock characterization-Methods for handling deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock - Combined approach to deadlock handling.

Unit-III: (12 hours)

Memory Management : Background - Swapping - Contiguous Memory Allocation - Paging - Segmentation - Segmentation with Paging. Virtual Memory : Demand Paging - Process Creation - Page Replacement - Allocation of Frames - Thrashing .

Unit-IV: (12 hours)

File-System Interface : File Concept - Access Methods - Directory Structure - File-System Mounting - File sharing –Protection. File-System Implementation: File-System Structure - File-System Implementation - Directory Implementation - Allocation Methods - Free-Space Management.

Unit-V: (12 hours)

Protection and Security : Protection - Goals of Protection - Domain of Protection- Access Matrix - Implementation of Access Matrix - Revocation of Access Rights –Capability- Based Systems - Language-Based Protection. Security: The Security Problem - User Authentication - Program Threats - System Threats - Securing System and Facilities - Intrusion Detection - Cryptography - Computer-Security Classifications.

Book for Study

1. Abraham Silberschatz and Peter Baer Galvin, “ Operating System Concepts”, 6th edition, 2007.

Books for Reference

1. Harvey M. Deitel, “An Introduction to Operating System “, Addison Wesley Publishing Company, California, 1984.
2. Andrew S. Tanenbaum, “Modern Operating Systems”, Prentice Hall of India Private Ltd, New Delhi, 1997.

Sem. II

17PCA2112

Hours/Week: 4

Credits: 3

PROBABILITY AND STATISTICS

Assurance of Learning

- * Knowing the basic concepts of Probability Theory
- * Understanding the Distribution Function
- * Testing the different hypothesis of various environment
- * Having the idea of ANOVA and experimental design

Unit-I: (12 hours)

Sample space: Events - Probability - Probability axioms - addition and multiplication law of probabilities - conditional probability - Independent events - Baye’s theorem.

Unit-II: (12 hours)

Random Variables: distribution functions (discrete and continuous) - Joint probability distribution - Marginal and conditional distribution. Mathematical expectations - Moment Generating Functions. Chebyshev’s inequality.

Unit-III: (12 hours)

Discrete distributions: Binomial and Poisson -Continuous distributions:Uniform, Exponential and Normal. Correlation and Regression.

Unit-IV: (12 hours)

Testing of hypothesis: Tests based on normal population. Applications of chi -square, Student’s-T, F- distributions - Chi-square Test - goodness of fit - Test based on mean, means, variance, correlation and regression coefficients.

Unit-V: (12 hours)

Analysis of Variance (one way and two way classifications). Design of Experiments - Principles of Design of Experiments - Completely Randomized Design - Randomized Block Design and Latin Square Design.

Note: Stress is given on the working of problems.

Books for Study

Units I, II, III, IV

1. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 11th edition, 2002.

Unit V

2. S.C. Gupta and V.K. Kapoor, "Fundamentals of Applied Statistics", Sultan Chand & Sons, New Delhi, 4th edition, 2007.

Books for Reference

1. Erwin Kryszig, "Introductory Mathematical Statistics", John Wiley & Sons, New York, 1990.
2. J.S. Milton and J.C. Arnold, "Probability and Statistics in Engineering and Computer Science", McGraw Hill, New York, 1986.

Sem. II

17PCA2201A

Hours/Week: 4

Credits: 4

Core Elective-I: PYTHON PROGRAMMING

Assurance of Learning

- * To explore the fundamental concepts of Python
- * To understand Basics of Python programming language
- * To solve simple problems using Python

Unit-I:

(12 hours)

Introduction to Python: Features of Python - How to Run Python - Identifiers - Reserved Keywords - Variables - Comments in Python - Indentation in Python - Multi-Line Statements - Multiple Statement Group (Suite) - Quotes in Python - Input, Output and Import Functions - Operators. Data Types and Operations: Numbers - Strings - List - Tuple - Set - Dictionary - Data type conversion.

Unit-II:

(12 hours)

Flow Control: Decision Making - Loops - Nested Loops - Types of Loops. Functions: Function Definition - Function Calling - Function Arguments - Recursive Functions - Function with more than one return value.

Unit-III:

(12 hours)

Modules and Packages: Built-in Modules - Creating Modules - import Statement - Locating Modules - Namespaces and Scope - The dir() function

- The reload() function - Packages in Python - Date and Time Modules. File Handling: Opening a File - Closing a File - Writing to a File - Reading from a File - File Methods - Renaming a File - Deleting a File - Directories in Python.

Unit-IV:

(12 hours)

File Handling: Opening a File - Closing a File - Writing to a File - Reading from a File - File Methods - Renaming a File - Deleting a File - Directories in Python. Object Oriented Programming: Class Definition - Creating Objects - Built-in Attribute Methods - Built-in Class Attributes - Destructors in Python - Encapsulation - Data Hiding - Inheritance - Method Overriding - Polymorphism.

Unit-V:

(12 hours)

Exception Handling: Built-in Exceptions - Handling Exceptions - Exception with Arguments - Raising an Exception - User-defined Exception - Assertions in Python. Regular Expressions: The match() function - The search() function - Search and Replace - Regular Expression Modifiers: Option Flags - Regular Expression Patterns - Character Classes - Special Character Classes - Repetition Cases - findall() method - compile() method.

Text Book(s)

1. Jeeva Jose and P. Sojan Lal, "Introduction to Computing and Problem Solving with PYTHON", Khanna Book Publishing Co. (P) Ltd., 2016.

Book for References

1. Wesley J. Chun, "Core Python Programming", Second Edition, Prentice Hall Publication, 2006.

Sem. II

17PCA2201B

Hours/Week: 4

Credits: 3

Core Elective-I: COMPUTER SIMULATION

Assurance of Learning

- * Knowing the basic concepts of simulation
- * Understanding and applying mathematical and statistical models for simulation
- * Learning the generation and usage of random numbers
- * Learning Input modelling for simulation and validating the input and output

Unit-I: (12 hours)
 Introduction to system simulation: System concepts - Components of a system - Discrete and continuous systems - System modeling - Types of models - System simulation - Steps in a simulation study. General Principles - Concepts in Discrete-Event Simulation. The Event Scheduling/Time Advance Algorithm - World Views - Manual Simulation Using Event Scheduling

Unit-II: (12 hours)
 Mathematical and Statistical Models: Statistical Models in Simulation - Review of Terminology and Concepts - Useful Statistical Models - Random number generation: Techniques for generating random numbers -Discrete Distributions - Continuous Distributions - Poisson Process - Properties of a Poisson Process - Non stationary Poisson Process - Empirical Distributions

Unit-III: (12 hours)
 Queueing Models: Characteristics of Queueing Systems - Queueing Notation Long-Run Measures of Performance of Queueing Systems - Steady-State Behavior of Infinite-Population Markovian Models - Steady-State Behavior of Finite-Population Models (M/Mic/KIK) - Networks of Queues

Unit-IV: (12 hours)
 Random-Number Generation: Properties of Random Numbers - Generation of Pseudo-Random Numbers - Techniques for Generating Random Numbers - Linear congruential method - Multiplicative congruential method - Tests for random numbers - Frequency tests - Auto correlation tests - Random variate generation: Inverse transformation method - Exponential - Uniform - Empirical discrete - Empirical continuous distributions

Unit-V: (12 hours)
 Input modelling for simulation - Data collection - Identifying the distribution using histograms - Parameter estimation - Goodness of fit test - Verification and Validation of Simulation Models - Model Building, Verification, and Validation - Verification of Simulation Models - Calibration and Validation of Models - Face Validity - Validation of Model Assumptions - Validating - Input-Output Transformations - Input-Output Validation: Using Historical Input Data - Input-Output Validation: Using a Turing Test - Output analysis for a single model: Types of simulations with respect to output analysis - Output analysis for terminating simulations - Output analysis for steady state simulations

Book for Study:
 1. Banks, J., Carson, J.S., Nelson, B.L., and Nicol, D.M., Discrete-Event System Simulation, 4th Edn. Pearson Education, Inc., 2007.

References
 1. Law, A.W. and Kelton, W.D., Simulation Modelling and Analysis, McGraw Hill International, 2000
 2. Gordon, G., System Simulation, Second Edition, Prentice Hall of India, 1995.

Sem. II Hours / Week: 4
17PCA2402A Credits: 4

**IDC (WS):
 DATA ANALYSIS USING R**

Assurance of Learning
 • Perform data analysis with statistical techniques using R
 • Interpret data in both Diagrammatic and Graphical Representation
 • Perform appropriate statistical tests using R

Unit-I: (10 Hrs)
 INTRODUCTION TO R: R as a Statistical Software and Language - R as a Calculator - R Preliminaries - Methods of Data Input - Data Accessing or indexing - Built-in Functions.

Unit-II: (10 Hrs)
 GRAPHICS: Graphics With R - Graphics Functions - Saving, Storing and Retrieving Work - Diagrammatic Representation of Data - Graphical Representation of Data - Measures of Central Tendency and Dispersion.

Unit-III: (10 Hrs)
 PROBABILITY AND PROBABILITY DISTRIBUTIONS: Probability: Definition and Properties - Probability Distributions - Some Special Discrete Distributions

Unit-IV: (10 Hrs)
 CORRELATION: Introduction - Correlation - Types of Correlation - Scatter Diagram- Coefficient Correlation and its Properties - Computation of Correlation Coefficient - Inference Procedures for Correlation Coefficient.

Unit-V: (10 Hrs)
REGRESSION ANALYSIS: Linear Regression - Linear Regression Model – Model Assumptions - Linear Calibration - Inference Procedures for Simple Linear Model - Validation of Linear Regression Model.

Books for Study

1. Sudha G. Purohit, Sharad D. Gore, Shailaja R. Deshmukh, “Statistics Using R”, Narosa, Publishing House Pvt. Ltd.. 2nd Ed., 2015.

Books for Reference

1. John Maindonald and John Braun. “Data Analysis and Graphics Using R”. Cambridge University Press, Cambridge, 2003.
2. Brian Everitt and Torsten Hothorn. “A Handbook of Statistical Analyses Using R”. Chapman & Hall/CRC, Boca Raton, FL, 2006. ISBN 1-584-88539-4.

Sem. II Hours/Week: 4
17PCA2402B Credits: 4

IDC-II (WS): MATLAB

Assurance of learning

- * To introduce the Mathematical software MATLAB for high-performance numerical computations and visualization.
- * To learn MATLAB built-in functions provided to solve all type of scientific problems.

Unit-I: (12 hours)
Basics of MATLAB: Basics, windows, Variables, File types, Matrices and Vectors, Matrix manipulation, Matrix and Array Operations.

Unit-II: (12 hours)
Matrix functions: Arithmetic operations, Relational operations, Logical operations, Elementary math functions, Matrix functions, Manipulating character strings, Array Operations, Vectorization.

Unit-III: (12 hours)
Built-in functions - Inline functions, Anonymous functions, Built-in functions, Complex Arithmetic, Solving linear systems, Eigen Values and Vectors, Calculus.

Unit-IV: (12 hours)
MATLAB programming: Script Files, Function Files, Curve Fitting and Interpolation, Numerical - Integration, Ordinary Differential Equations, Statistics, Nonlinear Algebraic Equations.

Unit-V:

Graphics - Basic 2-D Plots, Specialized 2-D plots, 3-D Plots, 3-D Surface Graphics.

Book for Study:

1. Rudra Pratap, Getting started with MATLAB 7, Oxford University Press, 2008.

Book for Reference:

1. Brain R Hunt, Ronald L Lipsman, Jonathan M Rosenberg, A Guide to MATLAB for Beginners and Experienced Users, Cambridge University Press, 2003

Sem. II Hours / Week: 4
16PCS2402C Credits: 4

IDC (WS): PERVASIVE AND AD HOC NETWORKS

Assurance of Learning:

- * Understand the basics of Mobile Adaptability
- * Comprehension of Ad Hoc Networks and their security
- * Understanding of Wireless Network Security mechanisms

Unit-I: (12 hours)
MOBILE COMPUTING: Adaptability - The Key to Mobile Computing - Mechanisms for Adaptation - Development or Incorporation of Adaptations in Applications.

MOBILITY MANAGEMENT: Concept of Mobility Management - Location Management - Principles and Techniques.

Unit-II: (12 hours)
DATA DISSEMINATION: Mobile Data Caching - Mobile Cache Maintenance Schemes - Mobile Web Caching.
CONTEXT-AWARE COMPUTING: Ubiquitous of Pervasive Computing - Various Definitions and Types of Contexts - Context Aware Computing & Applications - Middleware Support.

INTRODUCTION TO MOBILE MIDDLEWARE: Definition of Mobile Middleware - Application - Agents - Service Discovery.

Unit-III: (12 hours)

INTRODUCTION TO AD HOC AND SENSOR NETWORKS: Overview - Properties of an Ad hoc Network -Unique Features of Sensor Networks - Proposed Applications - Challenges - Constrained Resources - Security - Mobility.

Unit-IV: (12 hours)

WIRELESS SECURITY: Traditional Security Issues - Mobile and Wireless Security Issues - Problems in Ad-hoc Networks.

APPROACHES TO SECURITY: Limit the Signal - Encryption - Integrity Codes - IPSec - Other Security Related Mechanisms.

Unit-V: (12 hours)

SECURITY IN WPAN: Security in Wireless Personal Area Networks - Basic Idea - Bluetooth Security Modes - Basic Security Mechanisms.

ENCRYPTION: Authentication - Limitation and Problems.

SECURITY IN WLAN: Security in Wireless Local Area Networks - Basic Ideas - Wired-Equivalent Privacy (WEP) - WEP Fixes and Best Practices.

Books for Study

1. Frank Adelstein, Sandeep K.S., Gupta Golden G, Richard III Loren Schwibert” Fundamentals of Mobile and Pervasive Computing”, TMG Ed. Pvt. Ltd., 2005.

Books for Reference

1. Roopa R Yavagal, Hasan Ahmed, Asoke K Talukder, “Mobile Computing: Technology, Applications and Service Creation”, 2nd Ed., Tata McGraw Hill Pvt. Ltd., 2010
2. Uwe Hansmann, Martin S. Nicklous, Lothar Merk, Thomas Stober, “Principles of Mobile Computing”, 2nd Ed., Springer, 2006.

Sem. II
17PCA2113

Hours/Week: 3
Credits: 2

SOFTWARE LAB-III: ‘C++’

Classes and Objects

1. Programs Using classes
2. Constructors
3. Static Polymorphism: Operator overloading & function overloading
4. Inheritance Types, Function Overriding
5. Dynamic Polymorphism using virtual functions, Pure virtual functions and abstract classes
6. Formatted I/O and File operation with Command Line Arguments
7. Exception Handling
8. Templates
9. Stack and its applications
10. Queue and its applications.

Sem. II
17PCA2114

Hours/Week : 3
Credits : 2

Software Lab-IV:
MULTIMEDIA

GIMP (Photoshop equivalent)

1. Cropping images using Marquee and Lasso Tools
2. Working with images using Paint Tools
3. Designing Text using Text Tools
4. Applying Layer Effects to Images and Texts
5. Designing Employee or Student ID card
6. Designing seasonal greetings
7. Working with Filters
8. Designing professional invitations (Conferences)
9. Designing brochures or posters for a technical symposium
10. Designing Flexible banners for your college
11. Create your own wallpaper for your Desktop
12. Design a Web banner for a website
13. Develop a website using slice tool

Synfig (Flash equivalent)

1. Create an animation for bouncing a ball
2. Create an animation for making wheel role
3. Create a web banner with simple animation
4. Develop a slide show of photos with transitions

Aptana (Dreamweaver equivalent)

1. Developing a simple webpage with images and links
2. Develop a webpage displaying the timetable of the Department
3. Design an application form for Student Admission
4. Create your own web blog for college events

Sem. III
17PCA3115

Hours / Week: 4
Credits: 3

PROGRAMMING IN JAVA

Assurance of Learning

- * Develop solutions for a range of problems using object-oriented programming.
- * Solve simple problems using the fundamental syntax and semantics of the Java programming language
- * Use the Java event-handling model to respond to events arising from the GUI components
- * Understand and implement advanced concepts of java like thread, JDBC, Networking, RMI

Unit-I: (12 hours)

CLASSES AND OBJECTS: General Form of A Class - Creation of Objects - Usage of Constructors - 'this' Keyword- Constructor Overloading-Copy Constructors-Static Data Members - Static Methods- Finalize Method.

INHERITANCE AND POLYMORPHISM: Inheriting Variables in a Class - Inheriting Methods in a Class - Inheritance And Constructors - Abstract Classes - Final Classes.

Unit-II: (12 hours)

INTERFACES AND PACKAGES: Interfaces-Structure of an Interface - Implementation of an Interface Interface Inheritance. Packages - Placing the Classes in a Package - Package Hierarchy- Access Control Modifiers.

APPLETS: The Life Cycle of an Applet -The Applet Class - Development

and Execution of a Simple Applet - Syntax Of Applet Tag- Methods in the Graphic Class.

Unit-III: (12 hours)

SWING:JApplet class - Icons - JLabel Control - JOptionPane Class - JTextField Control - JButton Control - JCheckBox Control - JRadioButton Control Menus.

EXCEPTION HANDLING: Default Exception Handling - Exception and Error Classes - Catch Block Searching Pattern - Custom Exceptions.

I/O STREAMS: Text And Binary Formats of Data - Input Stream and Output Stream Classes - Reader and Writer Classes - Data Output Stream and Data Input Stream Classes.

Unit-IV: (12 hours)

THREADS: Life Cycle Of A Thread - Creating And Running Threads - Method In The Thread Class - Setting The Priority of A Thread - Synchronization. NETWORKING:TCP Server Socket Class - TCP Socket Class.

JAVA DATABASE CONNECTIVITY: Establishing AConnection - Creation Of Data Tables Entering Data Into The Tables - Table Updating.

Unit-V: (12 hours)

REMOTE METHOD INVOCATION : Remote Interface-Java.Rmi. Server Package The Naming Class - Creating RMI Client And Server Classes. SERVLET: Servlet and Dynamic Webpages Life Cycle of a Servlet a Simple Servlet Javax. Servlet Package Retrieving the Values of Parameters.

COOKIES : Creating a Cookie and Sending it to the Client - Retrieving the Stored Cookies.

Book for Study:

1. C. Muthu, Programming with JAVA, Vijay Nicole Imprints Private Limited, 2nd Ed, Chennai, 2011

Book for Reference

1. Herbert Schildt, Java 2: Complete Reference, Tata McGraw Hill, 5th Ed., 2009

Sem. III
17SCS3101

Hours/Week: 4
Credits: 4

DATABASE SYSTEMS

Assurance of Learning:

- * To understand the relationship between database systems and Organizational/management context
- * To understand the workings of a relational database system and normalize data;
- * To give the detailed knowledge about the Different Approaches to the Database System giving emphasis to Relational Approach and Concurrency Management

Unit-I: (12 hours)

Introduction to DBS: Basic Concepts and Definitions - Data Dictionary - Database System - DBA - Database Languages - Database System Architecture: Schemas, Sub-schemas and Instances - Three-level Architecture - Data Independence - Mappings -Data Models - Types - ER Model - Specialization and Generalization - Relational Algebra and Calculus: Structure - Relational Algebra - Relational Calculus.

Unit-II: (12 hours)

Relational Query Languages: Introduction - Codd's Rules - Information System Based Language - Structured Query Language (SQL) - Embedded SQL.

Unit-III: (12 hours)

Normalization: Introduction to Database Design - Functional Dependency and Decomposition - Normalization - Normal Forms - BCNF - Multi-valued and Join Dependencies.

Unit-IV: (12 hours)

PL/SQL: A Programming Language: History - Fundamentals -Data types - Operators. Control Structures: Control Structures - Nested Blocks - SQL in PL/SQL - Data Manipulation - Transaction Control statements. PL/SQL Cursors and Exceptions - Named Blocks: Procedures - Functions - Packages -Triggers.

Unit-V: (12 hours)

Transaction Processing and Concurrency Control - Database Recovery System - Database Security - Parallel Database Systems: Introduction to Parallel databases - Architecture - Key Elements of Parallel Database

Processing -Distributed Databases - Architecture - Distributed Database design.

Books for Study

Unit I, II, III and V

1. S K Singh, "Database Systems Concepts, Design and Applications", Pearson Education, 2006.

Unit IV

2. Nilesh Shah, "Database Systems using ORACLE", Prentice Hall of India, 2005.

Books for Reference

1. Abraham Silberschatz, "Database Systems", McGraw Hill International, 1997.
2. CJ Date, "An Introduction to Database Systems", 6th Edn, Addison Wesley Publishing Company, New York, 1995.

Sem. III
16SCS3102

Hours/Week: 4
Credits: 4

DESIGN AND ANALYSIS OF ALGORITHMS

Assurance of Learning:

- * To give the basis for the core of computer science.
- * To give importance to finding the complexity (order) of algorithms.
- * To learn the linked lists and trees
- * To understand the searching and sorting methods.

Unit-I: (12 hours)

Algorithms: Introduction-Algorithm - Algorithm specification: Pseudocode Conventions, Recursive algorithms - Performance analysis: Space - Complexity, Time Complexity, Asymptotic Notation, Practical Complexities. (Sections: 1.1, 1.2, 1.3.1 to 1.3.4)

Unit-II: (12 hours)

Data structures and Queues: Arrays - ordered lists- Representation of Arrays-Stack and Queues - Fundamentals-Evaluation of Expressions. (Sections: 2.2,2.4,3.1,3.3)

Unit-III: (12 hours)

Linked lists and trees: Linked Lists - Singly Linked Lists- Linked Stacks and Queues-More - on Linked Lists-Simple algorithms of Doubly Linked Lists

(insertion and deletion only).Trees- Binary Trees- Binary Tree - Representations- Binary Tree Traversal. (Sections: 4.1,4.2,4.5,4.8,5.2,5.3,5.4).

Unit-IV: (12 hours)

Search and Sort: Divide and conquer - General method - Binary search - Finding the maximum and minimum in a set of items - Merge sort - Quick sort - Selection sort. Basic Traversal and Search Techniques for graphs: Breadth First Search - Depth First Search. (Sections: 3.1 to 3.5,6.2)

Unit-V: (12 hours)

Interpolations: Backtracking - The 8-Queens problem - Algebraic problems - The general method - Evaluation and interpolation - Horner's rule - Lagrange interpolation - Newtonian interpolation. (Sections: 7.1,7.2,9.1,9.2)

Books for Study:

Unit I, IV, V

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer algorithms, Galgotia Publications Pvt. Ltd., 2004.

Unit II, III

2. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Source, 1981.

Books for References:

1. A.V. Aho, J.E.Hopcroft, J.D. Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley Publ. Comp., 1974.
2. Seymour E.Goodman and S.T. Hedetniemi, Introduction to the design and analysis of algorithms, McGraw Hill International Edition, 2002 Unit I,IV,V

Sem. III
17PCA3104

Hours / Week: 3
Credits: 2

Software Lab:
JAVA

1. Classes & Objects
2. Inheritance & Polymorphism
3. Packages & Interfaces
4. Applet & Swing
5. Exception Handling
6. I/O Streams

7. Multithreading
8. Networking & JDBC
9. RMI
10. Servlets
11. Cookies
12. JDBC

Sem. III
17PCA3105

Hours/Week: 3
Credits: 2

Software Lab-VI:
RDBMS SQL Simple queries using
DDL, DML, and DCL

1. SQL functions
2. SET operations
3. View and Snapshots
4. Nested queries

PL/SQL

5. PL/SQL Block
6. Cursors
7. Database triggers
8. Subprograms and packages.

FORMS AND REPORTS

9. Designing forms with menus, buttons and List of values
10. Master-Detail form design.
11. Developing reports (Tabular, Master/detail, Matrix and Mailing label)

Sem. III
17PCA3202A

Hours/Week: 4
Credits: 4

COMPUTER ORGANISATION AND ARCHITECTURE

Assurance of Learning:

- * To give basic knowledge on various building blocks of a typical digital computer.
- * To understand the architecture of advanced microprocessors.

Unit-I: (12 hours)
Basic Computer Organisation and Design: Instruction codes - Computer registers - Computer Instructions - Timing and Control - Instruction cycle Memory reference instructions-Input/output & Interrupt - Design of Basic Computer - Design of Accumulator Logic. Micro programmed control: Control memory - Address sequencing - Micro program example - Design of control unit.

Unit-II: (12 hours)
CPU: General register organisation - Stack organisation - Instruction formats-Addressing modes - data transfer and manipulation - Program Control RISC. Pipeline & Vector Processing: Parallel processing - Pipelining Arithmetic pipeline - Instruction pipeline - RISC pipeline - Vector processing - Array processors.

Unit-III: (12 hours)
Computer Arithmetic: Addition, Subtraction, Multiplication and Division algorithms - Floating point arithmetic operations - Decimal arithmetic unit Decimal arithmetic operations.

Unit-IV: (12 hours)
Intel 8086-Introduction-8086 Architecture-8086 Addressing Modes of 8086-80186/80188 Architecture - Introduction to the 80286 Microprocessor Introduction to the 80386 Microprocessor - Special 80386 Registers.

Unit-V: (12 hours)
Introduction to the Pentium Microprocessor - Introduction to the Pentium Pro Microprocessor - Special Pentium Pro Features - Introduction to the Pentium II Microprocessor - The Pentium III - The Pentium 4 and Core2.

Books for Study

Units I, II, III

1. M. Morris Mano, "Computer System Architecture", Third Edition, Prentice Hall of India, New Delhi, 2003.

Units IV, V Note : Stress on architecture only.

2. Barry B. Brey, "The Intel Microprocessors 8086/ 8088,80186/80188, 80286, 80386,80486,Pentium, And Pentium Pro Processor, Fourth Edition, Prentice-Hall of India Pvt. Ltd, New Delhi.1999.

Book for Reference

1. M. Rafiquzzaman "Microprocessors Theory and Applications" Revised Edition, PHI Learning Pvt. Ltd, New Delhi, 2012.

Sem. III Hours/Week: 4
16PCS1201B Credits: 4

Core Elective-I: DATA STRUCTURES AND ALGORITHM DESIGN

Assurance of Learning:

- * Learn the fundamentals of data structures with their implementation and its applications
- * Learn to design and analysis of algorithms and in various algorithm design strategies
- * Give importance to find the complexity (order) of algorithms

Unit-I: (12 hours)
LINEAR DATA STRUCTURES: Concepts Of Non-Primitive Data Structures - Storage Structure For Arrays - Stacks - Operations On Stacks - Queues - Priority Queues.

Unit-II: (12 hours)
LINKED LINEAR LISTS: Operations On Linked Linear Lists - Circularly Linked Lists - Doubly Linked Linear Lists. NON-LINEAR DATA STRUCTURE: Trees - Binary Trees - Tree Traversal - Operations On Binary Trees - AVL Trees - Storage Representation and Manipulations of Binary Trees.

Unit-III: (12 hours)
ALGORITHMS: Algorithm Specification - Pseudo Code Conventions, Recursive Algorithms. DIVIDE AND CONQUER: General Method - Sequential Search - Binary Search - Finding The Maximum And Minimum - Merge Sort- Quick Sort- Insertion Sort - Selection Sort.

Unit-IV: (12 hours)
GREEDY METHOD: (a)General Method - Knapsack problem - Job Sequencing With Deadlines - Optimal Merge Patterns - Spanning Tree - Minimum Cost Spanning Trees. (b)ALGORITHM DESIGN METHODS: Sub goals - Hill Climbing and Working Backward - Heuristics - Backtrack Programming - Branch and Bound.

Unit-V: (12 hours)
DYNAMIC PROGRAMMING: General Method - Multistage Graphs - Single-Source Shortest Paths: General Weights - All Pair Shortest Path - Optimal Binary Search Trees - 0/1 Knapsack - Traveling Salesperson Problem.

Books for Study:

1. Jean-Paul Tremblay and Paul G.Sorenson, "An introduction to data structures with applications", 2nd Ed, Tata McGraw Hill Publishing Company Limited, New Delhi, 1995. Units I and II
2. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Computer Algorithms", Galgotia Publications, New Delhi, 2007. Units III, IVa and V
3. S.E. Goodman and S.T. Hedetniemi, "Introduction to the Design and Analysis of Algorithms", Tata McGraw Hill, International Edition, 1987. - Unit: IVb

Books for Reference

1. Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran, "Fundamentals of Computer algorithms", Galgotia Publications Pvt. Ltd., New Delhi, 2004.
2. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms" Addison Wesley, United States, 1987.

Sem. III
17PCA3402

Hours/Week: 4
Credits: 4

IDC (BS):WEB DESIGN

Assurance of Learning:

- * To get the basic knowledge about internet concepts.
- * To know the features of HTML and JavaScript.
- * To develop the programming skill in Markup and Scripting.
- * To design the web pages using HTML and Java Script.

Unit-I: (12 hours)

Networking Concepts: INTERNET - History - Applications - Users - Protocols - Host Machines and Host Names - Internet Architecture and Packet Switching- Client Server Model - Band width and Asynchronous Communication. Connection: Dial-up Access - Direct and Dedicated Connections - shell or TCP/ IP accounts - Domains and Addresses - IP addresses.

Unit-II: (12 hours)

HTML: Introduction to HTML Tags - Document Layout - Comments - Headings - Paragraphs -Breaks - Texts - Lists - Special Characters.

Unit-III: (12 hours)

HTML: Tables - Linking documents - Frames - Form and its elements.

Unit-IV: (12 hours)

JavaScript: Introduction to JavaScript - JavaScript in web pages - writing JavaScript with HTML - Basic programming techniques - operators and expressions - conditional checking - loops - functions - user defined functions - dialog boxes.

Unit-V: (12 hours)

JavaScript: JavaScript DOM: JSS DOM - understanding objects in HTML - browser objects - web page object hierarchy - Handling events - The form object - built-in objects - user defined objects - cookies - setting a cookie.

Books for Study:

Unit I

1. Wendy G.Lehnert, "Internet 101 - a beginners guide to the internet and the world wide web", addition wesley, 1999.

Unit- II, III, IV, V

2. Ivan N. Bayross, "Web enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP", 4th Revised Edition, BPB Publications, New Delhi, 2010.

Book for Reference

1. Chuck Musciano& Bill Kennedy, "HTML - The Definitive Guide", Shroff Publishers & Distributors Pvt. Ltd., Calcutta - 1999.

Sem. III
17PCA3118

Hours / Week: 4
Credits: 2

**Skill Based Course:
QUANTITATIVE APTITUDE****Assurance of Learning:**

- * To revise and master the basic techniques of arithmetic operations so that these skills will augment to their professional capacity.
- * To test analytical and quantitative skills

Unit-I: (12 Hrs)

Numbers- Decimal Fractions - Simplification - Square Roots- Cube roots

Unit-II: (12 Hrs)

Surds- Indices - Average - Problems in numbers and ages –Partnership

Unit-III: (12 Hrs)

Percentages - Profit and Loss- Time and Work - Time and Distance -

Unit-IV: (12 Hrs)
Problems on Trains - Simple Interest - Compound Interest- Logarithms

Unit-V: (12 Hrs)
Area - Calendar-Permutation and Combination- Probability.

Book for Study

1. R.S. Aggarwal, “Quantitative Aptitude for Competitive Examinations”, 21st Edition, S. Chand and Co. Ltd, New Delhi, 2015.

Book for Reference

1. Shripad Deo, “Quantitative Aptitude”, Allied Publishers Pvt. Ltd, 2014.

Sem: IV **Hours/Week : 4**
17PCA4118 **Credits: 3**

PROGRAMMING SMART DEVICES

Assurance of Learning:

- * Provide concepts to enable the students for creating applications for smart devices using android.
- * Providing essential skills and experiences to the students in developing applications on mobile platform
- * Students understand the operation of the application, application lifecycle, configuration files, intents, and activities
- * The students get a better understanding of the UI - components, layouts, event handling, and screen orientation.

Unit-I: (12 hours)

Introducing the Android Software Development Platform: Understanding Java SE and the Dalvik Virtual Machine - The Directory Structure of an Android Project- Common Default Resources Folders- The Values Folder- Leveraging Android XML- Screen Sizes- Desktop Clocks- Using Android Application Resources- Launching Application: The AndroidManifest.xml File - Creating Your First Android Application - Running the App- Adding an Application Icon- Adding Transparency.

Unit-II: (12 hours)

Android Framework Overview: The Foundation of OOP: The Object- The Blueprint for an Object: The Class - Providing Structure for Classes: Inheritance- Defining an Interface- Bundling Classes- An Overview of XML- The APK File- Android Application Components- Android Activities-

Android Services- Broadcast Receivers- Content Providers- Android Manifest XML.

Unit-III: (12 hours)

Screen Layout Design- Android View Hierarchies- Nesting Views- Defining Screen Layouts- Editing the main.xml File- Using Relative Layouts- Sliding Drawers- Using Padding and Margins with Views and Layouts.

Unit-IV: (12 hours)

UI Design: Buttons, Menus, and Dialogs: Using Common UI Elements- Adding an Image Button to Your Layout- Defining Multistate Image Button Graphics in XML - Editing the main.xml File- Replacing the Default Background- Adding a Text to Your Layout - Adding an Image- Using Menus in Android- Creating the Menu Structure with XML- Running the Application in the Android Emulator- Making the Menu Work- Adding Dialogs.

Unit-V: (12 hours)

An Introduction to Graphics Resources in Android: Introducing the Drawables- Implementing Images- Creating Animation in Android- Tween Animation in Android- Using Transitions- Creating 9-Patch Custom Scalable Images- Playing Video in Android Apps.

Book (s) for Study:

1. Wallace Jackson, “Android Apps for Absolute Beginners”, Apress, Copyright © 2011 by
2. Wallace Jackson, ISBN-13 (pbk): 978-1-4302-3446-3, ISBN-13 (electronic): 978-1-4302-3447-0,

Book for Reference:

1. Dave Smith and Jeff Friesen, “Android Recipes: A Problem - Solution Approach” , Rakmo Press (P) Ltd, New Delhi, 2011

Web Reference

1. Android Developer’s Guides - available at: <http://developer.android.com/>

Sem. IV
Code: 17PCA4122

Hours/Week : 4
Credit : 3

ACCOUNTING & FINANCIAL MANAGEMENT

Objective:

- * To present the whole range of bookkeeping and accountancy
- * To give comprehensive coverage to management accounts
- * To introduce the Tally accounting packages & its applications

Unit-I: (12 hours)

Accounting: Principles-Concepts-Conventions-Journals-Ledger-Trial Balance.

Unit-II: (12 hours)

Trading account: Profit and Loss Account-Balance Sheet-Adjustments-Error Correction

Unit-III: (12 hours)

Depreciation; Meaning-need-methods of charging depreciation (Straight Line Method Diminishing Balance Method). Tally: General framework - accounting applications.

Unit-IV: (12 hours)

Marginal Costing - Break Even Analysis - Standard Costing: Analysis of Variance.

Unit-V: (12 hours)

Budgeting: Characteristics - Advantages - Classification - Preparation of Budgets. Capital Budgeting: Meaning - Methods of Capital Investment Decision-making.

Books for Study

1. T.S Grewal, "Double Entry Book Keeping", Sultan chand Sons, New Delhi, 1986.
2. S.N. Mahewari, "Management Accounting", Sultan chand Sons, New Delhi, 1986.
3. R Ramachandran & R Srinivasan, "Management Accounting" (Theories, Problems & Solutions), Sriram Publications.

Book for Reference

1. M.C. Shukla, T.S. Grewal, "Advanced Accounting", S. Chand and Company (Pvt.) Ltd., Ram Nagar, New Delhi, 1988.

Sem. IV
17PCA4120

Hours/Week: 4
Credits: 3

GRAPH AND AUTOMATA THEORY

Assurance of Learning

- * To study the applications of Graph theory and the computer representations of graph
- * To give the fundamental ideas of shortest path algorithms
- * To motivate the students to know the principles of formal languages in their Programming Techniques

Unit-I: (12 hours)

Graph Introduction: Paths and Circuits - isomorphism, Connected & Disconnected Graphs, Euler graphs - Operations on Graphs - Hamiltonian Paths & Circuits.

Unit-II: (12 hours)

Trees and Matrix Representations: Properties of Trees, Rooted and Binary Trees, Spanning trees. Matrix representation of Graphs: Incidence Matrix, Adjacency Matrix, Circuit Matrix - Fundamental Circuit Matrix.

Unit-III: (12 hours)

Directed Graphs: Some types of digraphs, trees with directed edges. Graph Theoretic Algorithms - Computer representation of a Graph. Algorithms for connectedness & components, spanning tree, shortest path.

Unit-IV: (12 hours)

Finite State Systems: Basic definitions - Non-Deterministic Finite Automata - Finite Automata with epsilon moves-Regular Expressions, Applications of Finite Automata.

Unit-V: (12 hours)

variation and Introduction: Context- Free Grammars - Derivation Trees - Chomsky Normal Form - Greibach Normal Form - The Pumping Lemma for CFL's.

Note: Stress can be given to problem solving instead of proof of theorems in Units IV and V.

Books for Study

Units I, II, III

1. Narsing Deo, "Graph Theory with applications to Engineering and Computer Science", Prentice-Hall of India Limited, New Delhi, 2013.

Units IV, IV

2. John E. Hopcroft & Jeffery D. Ullman, "Introduction To Automata Theory, Languages and Computation", Narosa Publishing House, New Delhi, 2002.

Books for Reference

1. John E. Hopcroft & Jeffery D. Ullman, "Formal Languages and Their Relation to Automata", Addison - Wesley publishing company, London, 1969.
2. Bernard Kolman & Robert C. Busby, "Discrete Mathematical Structure for Computer Science" Prentice Hall of India, New Delhi, 1987.

Note: Stress to be on solving Numerical Problems only.

Sem. IV

Hours/Week: 4

17PCA4121

Credits: 3

COMPUTER NETWORKS AND SECURITY

Assurance of Learning

- * To provide overall knowledge in Computer Communication Networks and Security Concepts.
- * Effectively communicate technical information verbally, in writing, and in presentations.

Unit-I:

(12 hours)

Introduction: Definition for the networks-Uses of Networks - Network Architecture-Protocol hierarchies - Service Primitives - OSI Reference Model - ARPANET - Internet - Physical Layer Transmission Media - Telephone Systems.

Unit-II:

(12 hours)

Data link layer: Data link layer - Design Issues - Error Detection and Correction - Data Link Protocols - Sliding Window Protocols - Finite state Machine Model - Petri Networks-PPP-Polling - FDM.

Unit-III:

(12 hours)

Network Layer: Design Issues - Routing Algorithms - Congestion Control Algorithms - Inter Network Routing - Fragmentation.

Unit-IV:

(12 hours)

Transport Layer - Design Issues - Elements of Transport Protocols - The Internet - Transport Protocol (TCP &UDP) - Application Layer: Design Issues.

Unit-V:

(12 hours)

Network Security: Security Requirements and Attacks - Confidentiality with Symmetric Encryption - Message Authentication and Hash Functions - Public-key Encryption and Digital Signatures - Secure Socket Layer and Transport Layer Security - IPv4 and IPv6 Security.

Books for Study

1. Andrew S Tanenbaum, "Computer Networks", Prentice Hall of India, New Delhi, 1999.
2. William Stallings, "Data and Computer Communications", Prentice Hall of India, Seventh Edition, 2004. (For Unit V)

Books for Reference

1. Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGraw Hill, New York, 1985.
2. Behrouz A Fourouzan, "Data Communications and Networking", McGraw Hill, Fourth Edition, 2006.

Sem. IV

Hours/Week: 3

17PCA4122

Credits: 2

Software Lab-VII:

XML AND ANDROID PROGRAMMING

XML:

1. XML document creation
2. Style sheets: CSS
3. Style sheets: XSL
4. XSL templates
5. Validation using DTD
6. SAX and DOM

Android:

1. Different Layout design including nested layout for a single biodata.
2. Arithmetic Operation for two numbers
3. Business Calculator
4. Animation: Bouncing of a ball
5. Intent
6. Database SQ Lite: Student Biodata
7. Fragments - Tablet Programming
8. Media Player

Sem. IV
17PCA4123

Hours/Week: 2
Credits: 2

**Software Lab-VIII:
PHP AND MYSQL**

PHP

1. Develop a PHP program using controls and functions
2. Develop a PHP program and check message passing mechanism between pages.
3. Develop a PHP program using String function and Arrays.

PHP ADVANCED CONCEPTS

4. Develop a PHP program using parsing functions (use Tokenizing)
5. Develop a PHP program and check Regular Expression, HTML functions, Hashing functions.
6. Develop a PHP program and check File System functions, Network functions, Date and time functions.
7. Develop a PHP program using session
8. Develop a PHP program using cookie PHP / MYSQL
9. Develop a PHP program to display student information using MYSQL table.
10. Develop a college application form using MYSQL table.

Sem. II
17PCA4204A

Hours/Week: 5
Credits: 4

DATA WAREHOUSING AND DATA MINING

Assurance of Learning:

- * Ability to understand data preparation
- * Learn to identify the association rule mining and to do clustering
- * Develop the ability to apply the knowledge on data mining projects

Unit-I: (15 hours)
Data mining –introduction - data understanding and data preparation

Unit-II: (15 hours)
Association rule mining - classification

Unit-III: (15 hours)
Cluster analysis - Web mining

Unit-IV: (15 hours)
Search engines and query mining - data warehousing

Unit-V: (15 hours)
Online Analytical Processing - Information privacy and data mining

Book for Study:

1. G.K. Gupta, "Introduction to Data mining with Case Studies", PHI Learning Pvt. Ltd., 2006.

Books for Reference

1. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers an imprint of Elsevier, 3rd Ed, 2012.
2. Margret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2003.

Sem. IV
17PCA4204B

Hours/Week: 4
Credits: 4

**Core Elective (WS):
INFORMATION STORAGE AND MANAGEMENT**

Assurance of learning :

- * To impart the basic and advanced concepts in Information storage and Management with various storage models and systems.

Unit-I: Introduction to Information Storage and Management (12 hours)

Information Storage: Data - Types of Data - Information - Storage - Evolution of Storage Technology and Architecture - Data Center Infrastructure - Core Element - Key Requirement for Data Center Elements - Managing Storage Infrastructure - Key Challenges in Managing Information- Information Lifecycle: Information Life Cycle Management - ILM Implementation - ILM Benefits - Direct Attached Storage and Introduction to Scsi: Types of DAS Internal DAS, External DAS - DAS Benefits and Limitation - Disk Drive Interfaces - Idle/Ata, Sata, IDE/ATA, SATA Parallel SCSI - Introduction to Parallel SCSI: Evolution of SCSI - SCSI Interface - SCSI-3 Architecture - Parallel SCSI Addressing - SCSI Command Model - CDB Structure - Operation Code - Control Field - Status.

Unit-II: Storage System Environment and RA/D (12 hours)

Components of Storage System Environment: Host - Connectivity- Storage Disk Drive Components - Platter, Spindle, Read/Write Head, Actuator Arm Assembly, Controller, Physical Disk Structure, Zoned Bit Recording, Logical Block Addressing - Disk Drive Performance: Disk Service Time - Logical Components of the Host - Operating System - Device Driver - Volume Manager File System - Application- Data Protection: RA/D: Implementation of RA/D Software RA/D - Hardware RA/D - RA/D Array Components - RA/D Levels Striping - Mirroring - Parity - RA/D 0 - RA/D 1 - Nested RA/D- RA/D 3 - RA/D 4 - RA/D 5 - RA/D6 - RA/D Comparison - RA/D Impact on Disk Performance: Application IOPS and RA/D Configuration - Hot Spares.

Unit-III: Intelligent Storage System & Storage Area Network (12 hours)

Components Of An Intelligent Storage System: Front End - Cache - Back End - Physical Disk - Intelligent Storage Array - High End Storage Systems Midrange Storage System - Storage Area Network: Fibre Channel: Overview The SAN and its Evolution - Components of SAN - Node Ports - Cabling - Interconnect Devices - Storage Arrays - SAN Management Software - FC Connectivity- Point to Point - Fibre Channel Arbitrated Loop - Fibre Channel Switched Fabric - Fibre Channel Ports - Fibre Channel Architecture : Fibre Channel Protocol Stack - Fibre Channel Addressing - FC Frame - Structure and Organization of FC Data - Flow Control - Classes of Service - Zoning - Fibre Channel Login Types - FC Topology - Core-Edge Fabric - Mesh Topology.

Unit-IV: Network Attached Storage & Content Addressed Scheme

(12 hours)

Network Attached Storage: General Purpose Servers Vs NAS Devices - Benefits of NAS - NAS File I/O - File System And Remote File Sharing - Accessing a File System - File Sharing - Components of NAS - Nas Implementation: Integrated NAS - Gateway NAS - Integrated NAS Connectivity - Gateway NAS Connectivity - NAS File Sharing Protocols - NFS, CIFS - NAS I/O Operations - Hosting and Accessing Files on NAS - Factors Affecting NAS Performance and Availability - Content Addressed Storage: Fixed Contents and Archives - Types of Archives - Features and Benefits of CAS CAS Architecture - Object Storage and Retrieval in CAS - CAS Example - Healthcare Solution : Storing Patient Studies.

Unit-V: Storage Virtualization, Backup and Recovery (12 hours)

Forms of Virtualization: Memory Virtualization - Network Virtualization - Server Virtualization - Storage Virtualization - SNIA Storage Virtualization Taxonomy

Storage Virtualization Configuration - Storage Virtualization Challenges - Scalability - Functionality - Manageability - Support - Types Of Storage Virtualization: Types of Storage Virtualization - Block-Level Storage Virtualization - File Level Virtualization - Backup And Recovery: Backup Process - Disaster Recovery - Operational Back Up - Archival - Backup Consideration - Backup Granularity - Recovery Considerations - Backup Methods - Backup Process - Backup And Restore Operations - Backup Topologies - Serverless Backup - Backup in NAS Environment - Backup Technologies - Backup to Tape - Physical Tape Library - Backup to Disk - Virtual Tape Library.

Book for Study

1. EMC Education services, "Information Storage and Management Storing", Wiley India Edition, ISBN:9788126521470.

Book for Reference

1. G. Somasundaram and Alok Shrivatsava, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley, 2009.

**Sem. V
17PCA5123**

**Hours/Week: 4
Credits: 3**

DISTRIBUTED TECHNOLOGIES

Assurance of Learning:

- * To understand the architectures of distributed systems.
- * To understand and compare the technologies associated with J2EE and DOTNET.
- * To understand the disconnected data access technology in ADO.NET.

Unit-I: (12 hours)

Client server architecture: 2-tier model - 3-tier model - n-tier model - J2EE architecture - DOTNET architecture - MVC architecture.

Unit-II: (12 hours)

Presentation services: JSP - Javamail - Interaction services: - CORBA - XML- XSL.

Unit-III: (12 hours)

Component model: EJB : Session Beans: Stateless and Stateful - Entity Beans- CMP and BMP - Message Driven Beans.

Unit-IV: (12 hours)

ASP.NET : Introduction - architecture - ASP.NET Runtime - ASP.NET Parser-Assembly - Page class. Web Server Controls - HTML Controls - AdRotator and Calendar controls - Validation Controls - Security Management.

Unit-V: (12 hours)

ADO.NET: System. Data, Sql Client and Xml namespaces - Provider objects and Consumer objects - Disconnected data access - Grid View & Form View.

Books for Study:

Unit I,II

1. Justin Couch, Daniel H.Steinberg, “J2EE Bible”, Wiley India (P) Ltd, New Delhi, 2002.

Unit III

2. Paul Tremblett, “Instant Enterprise Java y - Beans”, Tata McGraw Hill Publishing Company, New Delhi, 2001.

Unit IV,V

3. Platt S David, “Introducing Micorsoft .Net”, Prentice Hall of India, New Delhi, 2003.

Books for Reference:

1. Stephanie Bodoff, Dale Green, Eric Jendrock, “The J2EE tutorial”, Addison-Wesley, 2002.
2. Hitesh Seth, “Microsoft .NET: kick start”, Sams Publishing, 2004.

Sem. V

Hours/Week:4

17PCA5124

Credits: 3

SOFTWARE ENGINEERING

Assurance of Learning

- * To introduce the basic concepts of Software Engineering and the various phases in Software Development.
- * To understand the importance Requirement Engineering process.
- * To familiarize the basic concepts of Testing strategies and validation testing.
- * To enable the students to have a knowledge of Software Design Engineering Concepts.

Unit-I: (12 hours)

Introduction to Software Engineering: The Evolving Role of Software - Software - The changing nature of software - Software Myths. A generic

View of Process: A Layered technology - process models: The Waterfall Model - Evolutionary Process Models.

Unit-II: (12 hours)

System Engineering: Computer-Based Systems - The System Engineering Hierarchy. Requirement Engineering: Requirements Engineering Tasks - Initiating the Requirement Engineering Process - Eliciting Requirements - Building the Analysis Model - Requirement Analysis - Data Modeling Concepts - Flow Oriented Modeling - Class based Modeling - Creating Behavior Model.

Unit-III: (12 hours)

Design Engineering: Design process and Design Quality - Design Concepts - The Design Model. Creating the Architectural Design: Software Architecture - Data Design - Architectural Design - Mapping Data Flow into Software Architecture. Modeling component level design: Designing class based components - Performing User Interface Design: The Golden Rules - User Interface Analysis and Design - Interface Analysis - Interface Design Steps - Design Evaluation.

Unit-IV: (12 hours)

Testing Strategies: A Strategic Approach of Software Testing - Test strategies for Conventional Software and Object Oriented Software - Validation Testing - System Testing - The art of Debugging. Testing Tactics: Software Testing Fundamentals - White Box Testing - Basis Path Testing - Control Structure Testing - Block Box Testing - Object Oriented Testing Methods.

Unit-V: (12 hours)

Project Management: The Management Spectrum - The People - The Product - The Process - The Project. Estimation: The Project Planning Process - Resources - Software Project Estimation - Decomposition Techniques - Empirical Estimation Models. Project Scheduling: Project scheduling - Scheduling. Quality Management: Quality Concepts - Software Quality Assurance - Formal Technical Reviews.

Book for Study

1. Roger S. Pressman, “Software Engineering”, McGraw Hill, International 8th Edition, New York.

Book for Reference

1. Richard Fairley, “Software Engineering Concepts”, McGraw Hill, International Edn 2014.

Sem. V
17PCA5125

Hours/Week: 5
Credits: 4

BIG DATA AND CLOUD COMPUTING

Assurance of Learning:

- * To explore the fundamental concepts of Cloud Computing and their applications
- * To learn the concept of big data
- * To understand the R programming language
- * To solve statistical problems using R

Unit-I: (15 hours)

Introduction to Cloud Computing: Roots of Cloud Computing - Layers and Types of Cloud - Features of a cloud- Cloud Infrastructure Management - Infrastructure as Service providers - Platform as a Service providers - Challenges and Risks. Migrating into a Cloud: Introduction - Broad Approaches - Seven Step Model.

Unit-II: (15 hours)

Integration as a Service: Introduction - Evolution of SaaS - Challenges of SaaS Paradigm - Approaching the SaaS Integration Enigma - Integration Methodologies - SaaS Integration products and platforms - SaaS Integration Services - Businesses - to- Business Integration services - SaaS integration appliances - A Framework of Sensor - Cloud Integration. The Enterprise Cloud Computing Paradigm: Introduction - Issues for Enterprise Applications on the Cloud - Transition Challenges - Enterprise Cloud Technology and Market Evolution.

Unit-III: (15 hours)

Introduction to Big Data: Classification of Digital Data - Characteristics of Data - Evolution of Big Data - Definition of Big Data - Challenges with Big Data - Concept of Big Data - Traditional Business Intelligence (BI) versus Big Data. Big Data Analytics: Classification of Analytics - Data Science - Data Scientist - Few Top Analytics Tools. Big Data Technology Landscape: NoSQL (Not OnlySQL) - Hadoop.

Unit-IV: (15 hours)

Introduction to R: R as a Statistical Software and Language - R as a Calculator - R Preliminaries - Methods of Data Input - Data Accessing or indexing - Built-in Functions –Graphics With R - Saving, Storing and Retrieving Work.

Unit-V: (15 hours)

Descriptive Statistics: Diagrammatic Representation of Data - Graphical representation of data - Measures of central tendency.

Books for Study:

1. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, "Cloud Computing: Principles and Paradigms", Published by John Wiley & Sons, Inc., 2011. (Unit I and II)
2. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016. (Unit III)
3. Sudha G. Purohit, Sharad D. Gore, Shailaja R. Deshmukh, "Statistics Using R", Narosa Publishing House Pvt.Ltd., 2nd Ed., 2015. (Unit IV and V)

Book for References

1. Kris Jamsa, "Cloud Computing", Published by Jones and Baretlett Learning, 2013.
2. Soumendra Mohanty, Madhu Jagadeesh, and Harsha Srivatsa, "Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics", Apress Publication, 2013.
3. Judith Hurwitz, Alan Nugent, Dr. Fern Halper And Maricia Kaufman, "Big Data For Dummies", Wiley India Pvt. Ltd., 2013.
4. Roger D. Peng, "R Programming for Data Science", Lean Publishing, 2015.

Sem. V
17PCA5126

Hours/Week: 5
Credits: 3

OPERATIONS RESEARCH

Assurance of Learning

- * To give detailed knowledge about Linear programming
- * To study the concept of Transportation and Assignment Problem Solving Techniques
- * To give the basics of Inventory models, Queueing Theory and project scheduling.

Unit-I: (15 hours)

Linear Programming : Formulations and Graphical solution to L.P. Problem Simplex method-Degeneracy, Unbounded and infeasible solution – Two Phase Method.

Unit-II: (15 hours)

Linear Programming(contd):Duality-Primal and Dual Computations –Dual Simplex Method - Transportation problem and its solution - Assignment problem and its solution by Hungarian method.

Unit-III: (15 hours)

Project scheduling by PERT - CPM : Phases of project scheduling –Arrow Diagram - Critical Path Method - Probability Considerations in Project Scheduling.

Unit-IV: (15 hours)

Queueing Theory : Queueing System - Characteristics of Queueing system - classification of queues - Poisson Queues - M/M/1 and M/M/C Queueing Models.

Unit-V: (15 hours)

Inventory Management : Inventory Control - ABC analysis - Economic Lot size Problems - EOQ with uniform Demand and shortages - Limitations of inventories - Buffer stock - Determination of Buffer stocks.

Note: Stress to be on solving Numerical Problems only.

Book for Study

1. Kanti Swarup, P K Guptha and Man Mohan, “Operations Research”, Sultan Chand & Sons, New Delhi, 2013.

Books for Reference

1. Hamdy A. Taha, “Operations Research-An Introduction”, Macmillan Publishing Co, 5th Edition, 1987.
2. P.K.Gupta, Man Mohan, “Operations Research and Quantitative Analysis”, Sultan Chand & Sons, New Delhi First Edition, 1987.

Sem. V

17PCA5127

Hours/Week:4

Credits: 4

PRINCIPLES OF COMPILER DESIGN

Assurance of Learning:

- * To introduce the various phases of a compiler
- * To give the basic ideas on automata theory
- * To know the various parsing techniques.
- * To impart the code optimization techniques

Unit-I: (12 hours)

Different phases of a compiler - Finite state automaton and Lexical analysis - A simple approach to the design of lexical analyzers - Regular expressions NFA-DFA-reduced DFA- implementation of lexical analyzer- A language for specifying lexical analyzers.

Unit-II: (12 hours)

Context free grammars - Parsers - Derivation and Parse trees - Shift - reduce parsing - Operator-precedence parsing - Top-down parsing - Predictive parsers.

Unit-III: (12 hours)

Intermediate code generation - Translation - Implementation of syntax - directed translators - Intermediate code - Postfix notation - Parse trees and Syntax trees - Three-address codes - Quadruples and Triples - Translation of assignment statements.

Unit-IV: (12 hours)

Symbol tables - Data structures for symbol tables - Implementation of a simple stack allocation scheme - Implementation of block structured languages - Errors - Lexical phase error.

Unit-V: (12 hours)

Code optimization and Code generation: Elementary code optimization technique - Loop optimization - DAG representation of basic blocks - Value numbers and Algebraic laws - Object programs - Problems in code generation - A Machine model - A simple code Generator.

Book for Study

1. Alfred V. Aho, Jeffery D.Ullman, “Principles of Compiler Design”, Narosa Publishing House, New Delhi, 1985.

Books for Reference

1. William A.Barrett, Rodney M.Bates, David A.Gustafson and John D.Couch-”Compiler Construction Theory and Practice”, Galgotia Publishing Co., 1990.
2. Jean-Paul Trembley and Paul G. Sorenson,- “The Theory and Practice of Compiler Writing”, McGraw Hill,1985.

Sem. V
17PCA5128

Hours/Week: 3
Credits: 2

**Software Lab-IX:
DISTRIBUTED PROGRAMMING**

1. JSP - use of scriptlet.
2. JSP - use of java beans.
3. EJB - Session Bean.
4. EJB - Entity Bean.
5. ASP.NET - Server & Client side controls.
6. ASP.NET and ADO.NET - use of disconnected data object.
7. ASP.NET: Databind Controls.
8. DOM usage on the server side.
9. AJAX: Dynamic client - server interaction example.

Sem. V
17PCA5129

Hours/Week: 3
Credits: 2

**Software Lab-X:
R PROGRAMMING**

1. Built in functions
2. Data Frames and Matrices
3. Accessing Data and Indexing
4. Diagrammatic representation of data
 - a) Plotting data
 - b) Bar chart and its varieties
 - c) Bar plot
 - d) Pie chart
 - e) Stem-and-Leaf plot
5. Frequency distribution
6. Graphical representation of data
 - a) Rod-spike graph
 - b) Histogram
 - c) Frequency polygon
7. Measures of central tendency functions
8. Simple R programs

Sem. V
17PCA5130

Hours/Week: 2
Credits: 2

COMPREHENSIVE EXAMINATIONS

Assurance of learning

* To consolidate the understanding of the basics through frequent tests and interaction. Emphasis is on the concepts and fundamentals and the orientation is towards placement.

Unit-I: (6 hours)

C Debugging - Object Oriented Programming.

Unit-II: (6 hours)

Operating Systems - Smart Devices Operating Systems.

Unit-III: (6 hours)

Data Structures - Algorithms - Discrete Mathematics and Applications of Operations Research.

Unit-IV: (6 hours)

Database Concepts - Software Engineering.

Unit-I: (6 hours)

Web Technologies - Networking - Android programming.

Sem. V
17PCA5131

Hours/Week: 4
Credits: 2

**INTERVIEW PREPARATION &
MANAGERIAL SKILLS OBJECTIVES**

Assurance of learning

The learning objective of this paper is to enable the students to learn the art of getting things done in the modern business world by learning topics like lateral thinking, decision making, balancing work and life, corporate social responsibility, and work ethics.

Unit-I: Thinking Strategies (12 hours)

Strategic thinking - meaning - questions - thinks included in Strategic thinking - Process consideration in Strategic thinking - Strategic thinking competencies - importance of Strategic thinking - characteristics of Strategic Thinkers - Points to be kept in mind in Strategic thinking. Lateral Thinking -

meaning - why Lateral Thinking - when to use Lateral Thinking - Benefits of Lateral Thinking - Techniques used in Lateral Thinking - Who needs Lateral Thinking - How to use Lateral Thinking? - Conventional Vs Lateral Leaders - Questions asked by Lateral Leaders - becoming a Lateral leader.

Unit-II: Interpersonal Strategies: (12 hours)

Conflict Resolution - meaning - points to be understood before studying conflict resolution - sources of conflict - common reactions to conflict - role of perception in conflict - steps for Conflict Resolution - Conflict handling matrix - Functional and Dysfunctional outcome of conflict. Negotiation skills - process - styles - outcome - principles involved - negotiation model - being a negotiator - qualities of negotiator.

Unit-III: Impact of Resistance: (12 hours)

Reasons for Resistance - Types of people in facing changes - introducing change. Facing challenges - meaning - importance - path to facing challenges - benefits of facing challenges.

Unit-IV: Action Based Strategies (12 hours)

Risk taking - meaning - factors determining Risk Taking - Risk Management - users of Risk Management - Steps in Risk Management. Effective decision making - meaning - approaches - methods - steps - Decision making at the work place.

Unit-V: Behavioural Strategies (12 hours)

Motivation and Staying motivated - meaning - finding reason for being motivated - staying motivated at work place - staying motivated in negative work environment - staying motivated during crisis Balancing work and life - meaning - work satisfaction - gender differences - responsibility of the employers and employees - ways of balancing work and life - handling professional and personal demands - organizing your desk

Books for Study

1. Alex, K. "Managerial Skills", S.Chand & Co Ltd., New Delhi.

Books for Reference

1. Meena, K. and Ayothi, V. "A book on development of Soft Skills".
2. Daniel Goleman, "Emotional Quotient".
3. Norman Vincent Peale, "Power of the Plus factor".
4. Stephen Covey, "The Seven Habits of Highly Effective People".