Department of Computer Science Meenakshi College for Women (Autonomous)

M.Sc. Information Technology Curriculum 2019-2021

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Curriculum Overview

Programme Specific Objectives

- To help the student gain expertise in current information technology areas, primarily web and communication technologies, without compromising on core fundamentals.
- The syllabus is intent on providing a strong foundation in computers, with a clear technology focus.
- To equip the student with a basic knowledge of other domains, disciplines and skills, a social and environmental consciousness and a strong value base.

Eligibility

Candidates who have passed B.Sc. Mathematics / Statistics / Physics / Chemistry (with Allied Mathematics for atleast one year) / Electronics / Computer Science / Information Technology or B.C.A. or an equivalent degree, are eligible to undertake this course, subject to rules of the University of Madras.

Credit System

Minimum credits required by a candidate to be eligible for the MCA degree:

Part	Minimum no. of credits
Part A: Core & Electives	145
Part B: Soft Skills	8
Part C: Internship	3

Examination Pattern

Continuous Internal Assessment (CIA)	25 Marks
End-Semester Examination (ESE)	75 marks

To pass in a subject, the student would have to score a minimum of 50% in CIA, a minimum of 50% in ESE and a minimum aggregate of 55% in both put together according to the above weightage.

Pattern of Question Paper

General Pattern of the Question Paper for MSc (IT):

Section A: (2 * 10 marks = 20 marks)

- 10 questions given, all are compulsory.
- Two questions asked from each of the five units.

Section B: (5 * 10 marks = 50 marks)

- 5 questions, each with two parts in the either/or format are asked.
- At least one question is asked from each of the five units.
- Student must answer any one part in each of the 5 questions.

Section C: (2 * 15 marks = 30 marks)

• Student must answer any 2 out of the given 3 questions.

The subjects in the syllabus of M.Sc. (IT) is divided into five categories as follows:

1. Theory only

#	Subject Code	Subject
1	1IT05	Data Communication and Networking
2	2IT06b	Cloud Computing
3	2IT08b	Cyber Forensics
4	2IT10	Enterprise Resource Planning
5	3IT12b	Personal Software Process
6	4IT16	Business Enterprise Architecture and Green IT
7	Electives	

2. Theory with Problems

#	Subject Code	Subject
1	1IT03b	Operating Systems

3. Application Oriented

#	Subject Code	Subject
1	1IT02b	Data Structures and Algorithms
2	1IT04b	Digital Design and Computer Architecture
3	2IT09	Database Management Systems
4	3IT13a	Data Mining
5	4IT17	Mobile Application Development

4. Programming Language

#	Subject Code	Subject
1	2IT07a	Object Oriented Programming
2	3IT14	Web Application Development
3	3IT11a	Internet Programming

5. Application Oriented with Programming Language

#	Subject Code	Subject
1	1IT01a	Problem Solving Techniques and Applications

Question paper guidelines for M.Sc. (IT), for each type of subject indicated above is as follows:

#	Subject Type	Guidelines for Question-setting
1	Theory only	 Section A Questions could be of the following types: Multiple Choice / True or False One-word/one-line answer Definition Give one difference/similarity between two concepts Section B For each question, Option a) Descriptive question Option b) Direct descriptive / Application of formula / Specific algorithms / Application descriptions or comparisons / Principles or

#	Subject Type	Guidelines for Question-setting
		guidelines / Case study, etc.
		 Section C 2 questions - Descriptive question 1 question - Application of formula / Specific algorithms / Application descriptions or comparisons / Principles or guidelines, etc.
2	Theory with Problems	 Section A Questions could be of the following types: Multiple Choice / True or False One-word/one-line answer Definition Give one difference/similarity between two concepts Simple problem Section B For each question, Option a) Descriptive question Option b) Problems / Comparisons between concepts / Pin diagram / Algorithm / Block diagram Section C 2 questions - Descriptive question 1 question - Problems / Comparisons between concepts / Pin diagram
3	Application Oriented	 / Algorithm / Block diagram Section A Questions could be of the following types: Multiple Choice / True or False One-word/one-line answer Definition Give one difference/similarity between two concepts Simple problem / query / evaluation of expression, etc. Section B For each question, Option a) Descriptive question / Algorithm Option b) Descriptive question / Program / Algorithm / Algorithm Analysis / Problems / Application of algorithm on specific data set / Block Diagram / Queries / Application-oriented question / Comparison between concepts Section C 2 questions - Descriptive question / Algorithm / Algorithm Analysis / Problems / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / Application of algorithm on specific data set / Block Diagram / Oueries / App

#	Subject Type	Guidelines for Question-setting
4	Programming Language	 Section A Questions could be of the following types: Multiple Choice / True or False One-word/one-line answer Definition Give one difference/similarity between two concepts Simple code writing (maximum 3-4 lines) Find the bug / output given a code snippet
		 Section B For each question, Option a) Descriptive question (with or without code snippets to illustrate) Option b) Program
		 Section C 1 question - (with or without code snippets to illustrate) 2 questions - Program
5	Application Oriented with Programming Language	 Section A Questions could be of the following types: Multiple Choice / True or False One-word/one-line answer Definition Give one difference/similarity between two concepts Simple code writing (maximum 3-4 lines) Find the bug / output given a code snippet Section B Option a) Algorithm / Concept / Descriptive question Option b) Algorithm / Concept / Descriptive question on the programming language concept / Program Section C 1 question - Descriptive question on the programming language concept / Program 2 questions - Algorithm / Concept

Note: In Sections B and C, a question may be split into parts if so required.

Grading System

Students will be graded separately for Parts A, B and C. CGPA, Overall Grade and Classification will be given for Part A alone.

Scheme for conversion of marks to Grade Points and Letter Grade for each subject

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90 - 100	9.0 - 10.0	0	Outstanding
80 - 89	8.0 - 8.9	D+	Excellent
75 – 79	7.5 - 7.9	D	Distinction
70 - 74	7.0 - 7.4	A+	Very Good

60 - 69	6.0 - 6.9	А	Good
55 – 59	5.5 – 5.9	В	Average
00 - 54	0.0	U	Re-appear
Absent	0.0	AA	Absent

Grade Point Average (GPA) for a Semester =

Sum of product of grade points and credits for all subjects in the semester

Sum of the credits for the subjects in the semester

Cumulative Grade Point Average (CGPA) = $\frac{\text{Sum of the GPA of every semester}}{\text{Total number of semesters}}$

Overall Performance and Classification

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT	
9.5 - 10.0	O+	First Class Examplary *	
9.0 and above but below 9.5	0	First Class – Exemplary	
8.5 and above but below 9.0	D++		
8.0 and above but below 8.5	D+	First Class with Distinction *	
7.5 and above but below 8.0	D		
7.0 and above but below 7.5	A++		
6.5 and above but below 7.0	A+	First Class	
6.0 and above but below 6.5	А		
5.5 and above but below 6.0	B+	Second Class	
0.0 and above but below 5.5	U	Re-Appear	

*Applicable to candidates who have passed the courses prescribed for the programme in the first appearance; otherwise they are eligible for classification only.

Course Summary PART A: Core & Electives

Semester 1

Code	Subject	Credits
1IT01a	Problem Solving Techniques and Applications	5
1IT02b	Data Structures and Algorithms	5
1IT03b	Operating Systems	5
1IT04b	Digital Design and Computer Architecture	5
1IT05	Data Communication and Networking	5
1ITP1b	Practical I: Data Structures and Algorithms Laboratory	5
1ITP2a	Practical II: Data Communication and Networking Laboratory	5

Semester 2

Code	Subject	Credits
2IT06b	Cloud Computing	5
2IT07a	Object Oriented Programming	5
2IT08b	Cyber Forensics	5
2IT09	Database Management Systems	5
2IT10	Enterprise Resource Planning	5
2ITP3a	Practical III: Object Oriented Programming Laboratory	5
2ITP4a	Practical IV: Database Management Systems Laboratory	5

Semester 3

Code	Subject	Credits
3IT11a	Internet Programming	5
3IT12b	Personal Software Process	5
3IT13a	Data Mining	5
3IT14	Web Application Development	5
	Elective I	5
3ITP5a	Practical V: Web Application Development Laboratory	5
3ITP6c	Practical VI: Internet Programming Laboratory	5

Semester 4

Code	Subject	Credits
4IT16	Business Enterprise Architecture and Green IT	5
4IT17	Mobile Application Development	
	Elective II	5
4ITP7a	Practical VII: Mobile Application Development Laboratory	5
4ITPR	Project Work	10
4ITPV	Project Viva-Voce	10

Electives

A student would have to choose an elective stream from the following. The student would accordingly do the electives offered in her chosen stream, over Semesters 3 and 4.

#	Elective Stream	Elective I (Semester 3)	Elective II (Semester 4)
1	Communication Systems	Wireless Technology	Satellite Communication
2	Security Systems	Cryptography and Network Security	Biometric Systems
3	High-performance Computing	Parallel Computing	Grid Computing
4	Software Testing	Foundations of Software Testing and Quality Assurance	Software Testing

Elective 1

Stream	Code	Subject
1	3ITE1WT	Wireless Technology
2	3ITE1CR	Cryptography and Network Security
3	3ITE1PC	Parallel Computing
4	3ITE1ST	Foundations of Software Testing and Quality Assurance

Elective 2

Stream	Code	Subject
1	4ITE2SC	Satellite Communication
2	4ITE2BS	Biometric Systems
3	4ITE2GC	Grid Computing
4	4ITE2ST	Software Testing

PART B: Soft Skills

All students shall undergo the following courses to earn a total of 8 credits during the programme.

#	Code	Subject	Credits
1.	SAR1	Analytical Reasoning I	2
2.	SAR2	Analytical Reasoning II	2
3.	SAR3	Analytical Reasoning III	2
4.	OQCC	Quality Control Circles (Theory)	1
	OQCCP	Quality Control Circles (Presentation)	1

PART C: Internship

Every student shall undergo 8-10 weeks of internship (minimum 3 credits) spanning the summer vacation of the first year.

Code	Subject	Credits
INTIT	Summer Internship	3

Course Syllabus

Semester I

1IT01a - Problem Solving Techniques and Applications

OBJECTIVES:

- 1. To understand the notions of algorithms and programs, and to know of the basic problem solving strategies.
- 2. To learn C language and code solutions using the various features of C.
- 3. To learn efficient strategies and the algorithms to solve standard problems, thus laying a firm foundation for designing algorithmic solutions to problems.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand the systematic approach to problem solving.
- 2. Write programs in C language to solve problems.
- 3. Identify bugs in given code snippets and fix them.
- 4. Determine the output of a given code snippet.
- 5. Explain the approach and algorithms to solve specific problems, and understand the applications of such algorithms.

Unit	Course Content	L	P	Т
1	 Introduction: Notion of algorithms and programs – The problem- solving aspect – General problem-solving strategies - Problem solving using top-down design. Programming in C: Data types - Control statements – Functions – Arrays – Structures – Pointers – Pointers and Functions - Pointers and Arrays – Pointers and Structures - Dynamic memory allocation. 	12	I	2
2	Fundamental Algorithms : Exchanging the values of two variables – Counting - Summation of a set of numbers - Factorial computation - Sine function computation - Fibonacci Series generation - Reversing the digits of an integer – Base Conversion.	12	-	2
3	Factoring Methods : Finding the square root of a number - Generating prime numbers - Generating the prime factors of an integer – Generation of pseudo-random numbers - Raising a number to a large power – Computing the <i>n</i> th Fibonacci number.	14	I	2
4	Array Techniques : Array order reversal – Removal of duplicates from an ordered array - Array counting or histogramming – Partitioning an array – Finding the kth smallest element – Longest monotone subsequence.	12	I	2
5	 Text Processing and Pattern Searching: Text line length adjustment Left and right justification of text – Keyword searching in text – Text line editing – Linear pattern search. Recursive algorithms: Towers of Hanoi – Permutation generation. 	15	-	2
Total		65	-	10

- 2. Herbert Schildt, *The Complete Reference C*, Fourth Edition, McGraw Hill, 2010.
- 3. Yashawant Kanetkar, Exploring C, BPB Publications, 2008.
- 4. Yashawant Kanetkar, *Understanding Pointers in C*, BPB Publns, 1st Indian Ed., 2001. REFERENCE BOOKS
- 1. Jeri R. Hanly, Elliot B. Koffman, *Problem Solving and Program Design in C*, 5th Edition, Pearson Education, 2009.

^{1.} R. G. Dromey, *How to Solve it by Computer*, Prentice Hall of India, 2009.

1IT02b - Data Structures and Algorithms

OBJECTIVES:

- 1. To learn linear and non-linear data structures.
- 2. To learn specific searching and sorting algorithms.
- 3. To learn various algorithmic approaches and applications of the same.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Explain the various linear and non-linear data structures.
- 2. Describe the computer representation of linear and non-linear data structures.
- 3. Choose the appropriate data structure for simple problems.
- 4. Convert a given infix expression to postfix and evaluate it.
- 5. Given a binary tree, traverse the tree using the traversal algorithms learnt.
- 6. Given a graph, traverse the graph using the traversal algorithms learnt.
- 7. Given a graph, generate the minimum cost spanning tree using the algorithms learnt.
- 8. Understand the algorithmic design strategies of Divide-and-Conquer, Greedy, Dynamic Programming, Backtracking and Branch & Bound, and know how these strategies are applied to solve the given specific problems.
- 9. Explain specific searching and sorting algorithms and their characteristics.
- 10. Understand how to apply the specific algorithms learnt for searching and sorting, to solve any given problem.

Unit	Course Content	L	P	Т
1	Arrays: Abstract Data Types – The Array – The Polynomial – Sparse	0		C
1	Matrices - Representation of Arrays – The String.	9	-	Z
	Stacks and Queues: Stack – Queue – Circular Queue – Priority Queue			
2	- Dequeue - Evaluation of Expressions.	12		2
2	Linked Lists: Singly Linked List – Circular List – Doubly Linked List	12	-	Z
	- Generalized Lists.			
	Graphs: Graph Representations – Depth First Search – Breadth First			
	Search – Connected Components – Spanning Trees – Minimum Cost			
3	Spanning Trees (Kruskal's, Prim's, Sollin's Algorithms).	15	-	2
	Trees : Binary Trees – Binary Tree Traversals – Binary Tree			
	Representations – Binary Search Trees – Threaded Binary Trees.			
	Sorting: Bubble Sort – Insertion Sort – Merge Sort – Quick Sort –			
	Heap Sort – Radix Sort.			
4	Searching: Linear search – Binary search – Hashing.	15		2
4	Introduction to Algorithmic Design Methods: Divide-and-Conquer,	15	-	Z
	Greedy, Dynamic Programming using the sample problems of			
	knapsack problem, Multistage graph problem.			
	Introduction to Algorithmic Design Methods: Backtracking, Branch-			
5	and-Bound, using the sample problems of 8-Queens problem,	14	-	2
	Travelling salesman problem.			
Total		65	-	10

Note: In Units 4 and 5, no asymptotic analysis is required.

- 1. E. Horowitz, S. Sahni, Mehta, Fundamentals of Data Structures in C++, Galgotia, 1999.
- 2. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C*, 2nd Ed, A-W, 1997. REFERENCE BOOKS
- 1. A. V. Aho, J. D. Ullman, J. E. Hopcraft, *Data Structures and Algorithms*, A-W, 2001.
- 2. S. Sahni, Data Structures, Algorithms and Applications, McGraw Hill, 2001.
- 3. Yashwant Kanetkar, *Data Structures through C*, BPB Publishers, 2nd Edition, 2010.

- 4. Yedidyah, Langsam, Augensteil, Tanenbaum, Data Structures using C and C++, PHI.
- 5. Gilberg, Forouzan, Data Structures, Thomson Asia, Singapore, 2002.
- 6. Jeff Edmonds, How to think about Algorithms, Cambridge University Press, 2008.

1IT03b - Operating Systems

OBJECTIVES:

- 1. To learn the basic concepts and responsibilities of operating systems.
- 2. To understand any operating system based on the concepts studied.

OUTCOMES:

- 1. Articulate the main concepts, key ideas, strengths, limitations and core issues of OS.
- 2. Explain and solve problems using process and resource management algorithms.
- 3. Understand process synchronization.
- 4. Explain and solve problems using algorithms in deadlock handling.
- 5. Describe memory management techniques.
- 6. Calculate physical memory address, given a virtual memory address, based on the memory architecture.
- 7. Apply page replacement algorithms to solve problems.
- 8. Explain the basic concepts of file management & use disk scheduling algorithms to calculate effective access time.
- 9. Understand the basic commands & constructs in shell programming & write simple programs.

Unit	Course Content	L	Р	Т
1	Introduction: Types of Operating Systems – Multiprogramming, Time sharing, Distributed system and Real-time Systems - I/O structure – Hardware protection - Storage Hierarchy - Components – Services - System calls – System programs – System Structure – Virtual machines - System Design and Implementation. Process and CPU Scheduling: Process Concept – Process Scheduling – Co-operating processes – Interprocess Communication - Scheduling Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple processor Scheduling.	10	-	2
2	 Process Synchronization: The Critical Section Problem – Synchronization Hardware – Semaphores, Classical Problem of Synchronization, critical Regions, Monitors. Deadlocks: Characterization, Prevention, Avoidance and Detection, Recovery. 	15	-	2
3	Memory Management: Swapping, Single and Multiple Partition Allocation – Paging – Segmentation – Paged Segmentation. Virtual Memory: Demand Paging – Page Replacement Algorithms, Thrashing.	15	-	2
4	 File System Interface: File Concepts– Access Methods - Directory Structure – File-System Mounting – File Sharing – File Protection. File System Implementation: File System Structure and Implementation – Directory Implementation – Allocation Methods – Free Space Management. Mass-storage Structure: Disk Structure – Disk Scheduling - Disk Management – Swap-Space Management – RAID Structure. 	15	-	2
5	Shell Programming: Shell Variables – Export Command – The Profile File – First Shell Script - The Read Command – Positional Parameters – The \$? Variable – Set Command – exit command – Branching Control Structures – Loop - Control Structures – expr Command – Real Arithmetic - here command – sleep command – Script command – eval command – exec command	10	-	2
Total		65	-	10

TEXT BOOK

1. A. Silberschatz, P.B. Galvin, Gange, *Operating System Concepts*, 6th Edition, A-W, 2002. REFERENCE BOOKS

- 1. Harvey Deitel, Paul Deitel, David R. Choffnes, *Operating Systems*, 3rd Ed. Pearson, 2004.
- 2. Tanenbaum A. S., Operating Systems Design and Implementation, PHI, 1996.

1IT04b – Digital Design and Computer Architecture

OBJECTIVES:

- 1. To learn the functional units of a digital computer, representation codes, gates, combinational circuits and sequential circuits.
- 2. To learn the concepts that are building blocks of computer architecture.

OUTCOMES:

- 1. Understand and solve problems in number systems, conversions, binary arithmetic.
- 2. Use various techniques to simplify Boolean functions and design gated circuits.
- 3. Design and explain the design of combinational circuits.
- 4. Explain the basic types and circuitry of flip-flops, registers and counters.
- 5. Explain the fundamentals of Register Transfer Language.
- 6. Write any given expression in various instruction formats.
- 7. Calculate effective address of operands for various addressing modes.
- 8. Explain the concept of pipelining and design a pipeline for a simple problem.
- 9. Explain I/O Interface concepts.

Unit	Course Content	L	Р	Т
	Binary Systems: Number System – Number Base Conversions –			
	Complements – Binary Codes – Binary Logic.			
	Boolean algebra and Logic Gates: Definition – Theorems and			
1	Properties – Boolean functions – Canonical and Standard forms –	15	_	2
1	Digital Logic Gates.	15		2
	Simplification of Boolean Functions: Karnaugh Map up to 5			
	variables – Sum-of-products and Product-of-sums simplification -			
	Don't care condition – Tabulation Method.			
	Combinational Logic: Design Procedure - Adders – Subtractors –			
	Code Converters – Analyzing a combinational Circuit - Multilevel			
2	NAND and NOR circuits – XOR and Equivalence Functions – Binary	15	-	2
	Parallel Adder – Decimal Adder – Magnitude Comparator – Decoders			
	– Multiplexers.			
	Sequential Logic: Flip Flops – Triggering of Flip-Flops – Analyzing a			
3	Sequential Circuit – State reduction and Assignment - Flip Flop	12	-	2
	Excitation tables – Design of sequential circuit – Design of Counters –			
	Registers - Smit Registers – Ripple and Synchronous Counters.			
	Register Transfer Logic: Register Transfer and Micro – Operations: Degister Transfer Longuage Pagister Transfer Bus and Mamory			
	Transfers Arithmetic Micro operations Logic Micro operations			
	Shift Micro operations			
4	Central Processing Unit: General Register Organization – Stack	13	-	2
	Organization – Instruction Formats – Addressing Modes – Data			
	Transfer and Manipulation – Program Control – RISC - Status Register			
	- Design of Shifter			
	Pipelining and Vector Processing: Parallel Processing – Pipelining –			
	Arithmetic Pipeline – Instruction Pipeline – RISC Pipeline – Vector			
	Processing – Array Processors			
5	Input-Output Organisation: Peripheral devices – I/O interface –	10	-	2
	Asynchronous Data transfer Methods: Strobe Control - Hand Shaking			
	– Modes of transfer – Priority interrupt - Direct Memory Access – I/O			
	Processor: CPU – IOP Communication.			
Total		65	-	10

TEXT BOOK

- 1. M. Morris Mano, Digital Logic and Computer Design, PHI, 1994.
- 2. M. Morris Mano, *Computer System Architecture*, 3rd Edition, Pearson, 2007.

REFERENCE BOOKS

- 3. David A. Patterson, John L. Hennessy, *Computer Organization and Design: The Hardware/Software Interface*, Fourth Edition, Morgan Kaufman Publications.
- 4. M. M. Mano and C. R. Kime, *Logic and Computer Design Fundamentals*, 2nd Edition, Pearson Education, Delhi, 2001.
- 5. Givone, Digital Design Principles, Tata McGraw Hill, New Delhi, 2002.
- 6. C. H. Roth Jr., *Fundamentals of Logic Design*, 5th Edition, Thomson Learning, Singapore, 2005.

1IT05 – Data Communication and Networking

OBJECTIVES:

- 1. To learn the basic concepts of data communication and computer networking.
- 2. To learn the basics of the OSI Reference Model.
- 3. To learn the protocols and algorithms involved in the Physical, Data Link, Network and Application layers of the OSI Model and the types of networking devices.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand the basic concepts involved in data communication and networking.
- 2. Explain the various classifications of network and transmission modes.
- 3. Understand the layers in the OSI Reference Model and TCP/IP Reference Model, and their responsibilities.
- 4. Understand the Physical and Data Link layer functions related to transmission media and error detection and correction mechanisms.
- 5. Explain the protocols and algorithms of the Network Layer, Transport Layer and Application Layer.
- 6. Explain the types and properties of networking devices.

Unit	Course Content	L	P	Т
1	Basics: Introduction to Data Communication, Network – Topology – Transmission mode – Classification of Network – OSI Model – Layers of OSI Model – Switching (Circuit Switching – Packet Switching – Message Switching)	14	-	1
2	Transmission Media : Guided Media – Unguided Media – Performance - Connection Oriented and Connectionless services (TCP/IP Protocol) - Types of Error – Error Detection – Error Corrections.	14	-	1
3	Multiplexing and DQDB : Multiplexing – Types of Multiplexing – Multiplexing Application – Project 802 – Ethernet – Token Bus – Token Ring – FDDI – IEEE 802.6 – SMDS.	14	-	1
4	Protocols: The Domain Name System (DNS) – Applications: Remote Login (TELNET, Rlogin) – File Transfer and Access (FTP, TFTP, NFS)	14	-	1
5	Internetworking Protocols and E-Mail Protocols: Repeaters – Bridges – Routers – Gateway – Routing algorithms – Electronic Mail (SMTP, POP, IMAP, MIME) – World Wide Web (HTTP).	14	-	1
Total		70	-	5

TEXT BOOKS

1. Behrouz Forouzan, Introduction to Data Communication and Networking, Fourth Edition, THM, 1998.

2. Douglas E. Comer, *Internetworking with TCP/IP – Principles, Protocols and Architectures*, Fourth Edition, Prentice Hall of India Private Limited, 2002. REFERENCE BOOKS

Fred Halsall, *Data Communication, Computer Networks and Open Systems*, A-W, 1995
 Uyless D. Black, *Computer Networks – Protocols, Standards and Interfaces*, II Ed, PHI, 2002.

3. A. S. Tannenbaum, *Computer Networks*, Fourth Edition, Pearson Education Inc., 2003.

4. Jean Walrand, Communication Networks, Second Edition, WCB/McGraw Hill, 1996.

1ITP1b - Practical I: Data Structures and Algorithms Laboratory OBJECTIVES:

- 1. To learn to code, debug and execute programs in C Language in an IDE
- 2. To learn to realize the data structures and algorithms as programs.

OUTCOMES:

- 1. Write programs in C Language to implement the data structures and algorithms given.
- 2. Code, debug and execute a C program in an IDE.

#	Course Content	L	P	Т
	Working with arrays:			
1	1. Addition and subtraction of polynomials using arrays		5	
	2. Stack using array	-	5	-
	3. Queue using array			
	Working with pointers:			
	4. Stack using linked list			
2	5. Queue using linked list		0	
	6. Circular linked list	-	9	-
	7. Doubly linked list			
	8. String manipulation using pointers			
	Working with graphs:			
3	9. Representing and building a graph		16	
5	10. Depth first search on a graph	-	10	-
	11. Breadth first search on a graph			
	Working with trees:			
4	12. Building a Binary Tree	-	16	-
	13. Binary Tree traversal – inorder, preorder, postorder			
	Sorting and Searching:			
	14. Bubble Sort			
5	15. Insertion Sort		15	
5	16. Merge Sort	_	15	-
	17. Quick Sort			
	18. Binary Search			
	Fundamental Algorithms:			
	19. Fibonacci series generation			
6	20. Reversing the digits of an integer	-	14	-
	21. Generating the prime factors of an integer			
	22. Generation of pseudo-random numbers			
Total		-	75	-

1ITP2a - Practical II: Data Communication and Networking Laboratory OBJECTIVES:

- 1. To learn to implement the protocols in the TCP/IP suite.
- 2. To learn socket programming fundamentals.

OUTCOMES:

- 1. Implement protocols using TCP, UDP and Raw Sockets.
- 2. Simulate routing algorithms and protocols.
- 3. To implement simple application using RMI.

#	Course Content	L	P	Τ
	Programs using TCP Sockets			
	a. To implement date and time server and client in java using TCP			
1	sockets.	-	10	-
	b. To implement echo server and client in java using TCP sockets			
	c. To implement a chat server and client in java using TCP sockets.			
	Programs using UDP Sockets			
2	a. To implement DNS server and client in java using UDP sockets.	-	10	-
	b. To implement a chat server and client in java using UDP sockets.			
2	Program using Raw Sockets		0	
3	To implement raw sockets like packet capturing and filtering using java.	-	0	-
	Program using RPC			
4	To implement factorial on a remote host and obtain its value from a	-	8	-
	client.			
5	Simulation of sliding window protocol		0	
5	To write a C program to perform sliding window.	-	0	-
	Experiment using simulators (like OPNET)			
6	To simulate the implementation of the routing protocol BGP (Border	-	8	-
	Gateway Protocol)			
7	To get the MAC or Physical address of the system using Address		0	
/	Resolution Protocol.	-	0	-
0	To simulate the Open Shortest Path First routing protocol based on the		0	
0	cost assigned to the path.		0	
	Simple Application using RMI			
9	To implement simple calculator on a remote host and invoke operations		7	
	from a client.			
To	tal	-	75	-

Semester II

2IT06b – Cloud Computing

OBJECTIVES:

- 1. To learn the main concepts, key technologies, strengths and limitations of cloud computing and the possible applications of cloud computing.
- 2. To learn the different types of cloud services and cloud service providers.
- 3. To learn cloud service architecture.

OUTCOMES:

- 1. Explain the main concepts, strengths and limitations of cloud computing.
- 2. Explain various applications on service models.
- 3. Identify the architecture, infrastructure and delivery models of cloud computing.
- 4. Select the suitable cloud service provider and apply an appropriate deployment model for an organization.
- 5. Understand the concept of abstraction and virtualization.
- 6. Understand the concept of cloud management and security.
- 7. Understand the working of cloud storage.

Unit	Course Content	L	Р	Т
1	 Defining Cloud Computing : Defining Cloud Computing – Cloud Types – Examining the characteristics of Cloud Computing – Assessing role of open Standards Understanding Cloud Architecture : Exploring the cloud computing stack – Connecting to the cloud Understanding Services and Applications by Type : Defining Infrastructure as a Service (IaaS), Defining platform as a Service (PaaS), Defining Software as a Service (SAAS), Defining Identity as a Service (IDaaS), Defining Compliance as a Service (CaaS) 	13	-	2
2	Understanding Abstraction and Virtualization: Using Virtualization Technologies – Load balancing and Virtualization – Understanding Hypervisors – Understanding Machine Imaging – Porting Applications Exploring Platform as a service: Defining services – Using PaaS Application Frameworks	13	-	2
3	Using Google Web Services : Exploring Google Applications – Surveying Google Aplications Portfolio –Exploring Google Toolkit – Working with the Google App Engine Using Amazon Web Services : Understanding Amazon Web Services – Amazon Web Service Components and Services – Working with the Elastic Compute Cloud (EC2) – Working with Amazon Storage Sytems – Understanding Amazon Database Services Using Microsoft Cloud Services : Exploring Microsoft Cloud Services – Defining the Windows Azure Platform – Using Windows Live	13	_	2

Unit	Course Content	L	Р	Т
	Managing the Cloud: Administrating the Clouds – Cloud Management Products – Emerging Cloud Management Standards			
4	- Establishing Identity and Presence	13	-	2
	Understanding Service Oriented Architecture : Introducing Service			
	Oriented Architecture – Defining SOA Communications – Managing			
	and Monitoring SOA – Relating SOA and Cloud Computing			
	Moving Applications to the Cloud : Applications in the Cloud –			
	Applications and Cloud APIs			
	Working with Cloud Based Storage : Measuring the Digital Universe			
5	- Provisioning Cloud Storage - Exploring Cloud Backup Solutions -	13	-	2
	Cloud Storage Interoperability			
	Communicating with the Cloud: Exploring Instant Messaging -			
	Exploring Collaboration Technologies – Using Social Networks			
Total		65	-	10

TEXT BOOK

1. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.

REFERENCE BOOKS

1. Kris Jamsa, Cloud Computing, Jones and Bartlett India Pvt. Ltd., 2014.

2. Michael Miller, *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online*, Que Publishing, 2008.

2IT07a - Object Oriented Programming

OBJECTIVES:

- 1. To appreciate the need for and characteristics of object orientation.
- 2. To learn the grammar of and to use the programming constructs of the C++programming language.
- 3. To learn to implement programs in C++ covering the object-oriented concepts.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Explain the various basic concepts of Object-orientation.
- 2. Conceptualize a given problem in an object-oriented way.
- 3. Write a program to solve a given problem, by applying the concepts of object orientation and features of C++.
- 4. Find and fix any bug in a given program snippet.
- 5. Determine the output of a given program snippet.

Unit	Course Content	L	Р	Т
1	OOP Concepts: Complexity in software - The need for object- orientation – Abstraction – Encapsulation – Modularity – Hierarchy. Basic Elements of C++: Classes – Objects – Data members and member functions – <i>private</i> and <i>public</i> access specifiers - Static members - Constructors – Singleton class - Destructors - Friend Functions and Friend Classes - Array of objects – Pointer to objects - <i>this</i> pointer – References – Dynamic memory allocation - Namespaces.	15	-	2
2	 Function Overloading: Overloading a function - Default arguments – Overloading Constructors. Operator Overloading: Overloading an operator as a member function – Overloading an operator as a friend function – Overloading the operators [], (), -> and comma operators – Conversion Functions. 	13	-	2
3	 Inheritance: Types of inheritance – <i>protected</i> access specifier –Virtual Base Class – Base class and derived class constructors. Run-time Polymorphism: Virtual Functions – Function overriding - Pure virtual function – Abstract base class. 	11	-	2
4	 Templates: Function templates – Overloading a function template – Class templates. Standard Template Library (STL): Containers: vector, list – Iterators: forward, backward – Algorithms: removing and replacing elements, sorting, counting, reversing a sequence. Exception Handling: Exceptions – <i>try</i>, <i>catch</i>, <i>throw</i> – Rethrowing an exception – Restricting exceptions - Handling exceptions in derived classes - <i>terminate()</i>, <i>abort()</i>, <i>unexpected()</i>, <i>set_terminate()</i>. 	13	_	2
5	I/O Streams: Formatted I/O with <i>ios</i> class functions - Manipulators – Creating own manipulator – Overloading << and >> operators. File I/O: <i>fstream</i> class– Opening and closing a file– Reading from and writing to a text file- Unformatted and Binary I/O– Random access I/O.	13	-	2
Total		65	-	10

TEXT BOOKS

1. Herbert Schildt, C++ - The Complete Reference, Third Edition, TMH, 1999.

2. Grady Booch, Object Oriented Analysis and Design, Pearson Education, 2008.

REFERENCE BOOKS

- 1. Bjarne Strousstrup, *The C++ Programming Language*, Addison Wesley, 2000.
- 2. J. P. Cohoon and J. W. Davidson, C++ Program Design An Introduction to Programming and Object-Oriented Design, Second Edition, McGraw Hill, 1999.
- 3. C. J. Lippman, C++ Primer, Third Edition, Addison Wesley, 2000.

2IT08b – Cyber Forensics

OBJECTIVES:

- 1. To learn the fundamentals of computer forensics technology and services.
- 2. To learn how to collect evidence using data recovery procedures.
- 3. To learn to analyze and validate forensics data using various tools.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Explain the fundamentals of computer forensics and the types of technology.
- 2. Describe methods for evidence collection and data recovery.
- 3. Explain the hardware and software tools used for evidence recovery.
- 4. Understand address data hiding techniques.
- 5. Understand various email investigation processes.
- 6. Identify the vulnerabilities and explain the acquisition procedures for mobile devices.

Unit	Course Content	L	Р	Т
	Overview of Computer Forensics Technology - Computer Forensics			
1	Fundamentals - Types of Computer Forensics Technology - Types of	13	-	2
	Vendor and Computer Forensics Services.			
2	Computer Forensics Evidence and Capture: Data Recovery -			
	Evidence Collection and Data Seizure – Duplication and Preservation	13	-	2
	of Digital Evidence – Computer Image Verification and Authentication.			
3	Computer Forensics Analysis: Discover of Electronic Evidence –	13	_	2
5	Identification of Data – Reconstructing Past Events – Networks.	15	-	2
	Current Computer Forensics Tools: Evaluating Computer Forensics			
	Tools Needs: Types of Computer Forensics Tools – Tasks performed			
4	by Computer Forensics Tools – Computer Forensics software tools –	13	_	2
-	Computer Forensics hardware tools.	15	-	2
	Computer Forensics Validation: Validating Forensic Data –			
	Addressing Data Hiding Techniques			
	E-Mail Investigation: Exploring the role of E-Mail in Investigations –			
	Exploring the roles of the client and the server in E-Mail –			
	Investigating E-Mail crimes and violations – Using Specialized E-Mail			
5	Forensics Tools.	13	-	2
	Cellphone and Mobile Device Forensics: Understanding Mobile			
	Device Forensics – Understanding Acquisition Procedures for Cell			
	Phones and Mobile Devices.			
Total		65	-	10

TEXT BOOK

- 1. John R. Vacca, Computer Forensics, Firewall Media, 2004.
- 2. Bill Nelson, Amelia Phillips and Cristopher Steuart, "Guide to Computer Forensics and Investigations" Third Edition, 2010.

REFERENCE BOOKS

- 1. Chad Steel, Windows Forensics, Wiley India, 2006.
- 2. Majid Yar, Cybercrime and Society, Sage Publications, 2006.
- 3. Robert M Slade, Software Forensics, Tata McGrawHill, 2004.

2IT09 - Database Management Systems

OBJECTIVES:

- 1. To understand the need, basic concepts and applications of DBMSs.
- 2. To learn the E-R model and basic operations of Relational Algebra.
- 3. To learn Relational Database concepts and Normalization concepts.
- 4. To learn advanced SQL.
- 5. To learn the fundamental concepts of transaction processing, concurrency control protocols and database system architectures.

OUTCOMES:

- 1. Explain the purpose, characteristics, components & applications of database management systems.
- 2. Know the fundamental operations of Relational Algebra and construct expressions.
- 3. Write DDL statements and advanced SQL queries.
- 4. Detect and fix errors in SQL statements and identify the output of given code.
- 5. Understand the basic concepts of NoSQL.
- 6. Understand E-R Model and construct an E-R diagram for a given simple database.
- 7. Understand normalization concepts and normalize a given simple database.
- 8. Understand the concepts of transaction management and recovery systems.
- 9. Explain the various protocols for concurrency control.
- 10. Describe the various types of database system architectures.

Unit	Course Content	L	Р	Т
1	 Introduction: Database System Applications – Purpose of Database Systems – View of data - Database languages - Relational Databases – Database design – Data Storage and Querying – Transaction management – Data mining and analysis - Database Architecture – Database users and administrators. Relational Model: Structure of Relational Databases – Relational Algebra Operations – Null Values – Modification of the database. 	10	-	2
2	 SQL: Data Definition – Basic Structure of SQL Queries – Set Operations – Aggregate Functions – Null Values – Nested Sub queries – Complex Queries – Views – Modification of the Database – Joined Relations. Advanced SQL: SQL Data Types and Schemas – Integrity Constraints – Authorization – Embedded SQL - Dynamic SQL – Functions and Procedural Constructs – Recursive Queries – Assertions - Triggers – Views. NoSQL: Introduction. 	13	_	4
3	 E-R Model: Constraints – E-R Diagrams – E-R Design Issues - Weak Entity Sets – Extended E-R Features - Reduction to Relational Schemes. Relational Database Design: Data Normalization – Tables, Classes and Keys – First Normal Form – Second Normal Form – Third Normal Form – Boyce-Codd Normal Form – Fourth Normal Form – Domain- key Normal Form – Data Rules and Integrity – Converting a Class diagram to Normalized tables – View Integration - Data Dictionary. 	12	_	5
4	Transactions: Transaction concept – Transaction state - Implementation of Atomicity and Durability – Concurrent executions - Serializability – Recoverability – Implementation of isolation – testing	15	-	2

Unit	Course Content	L	Р	Т
	for Serializability.			
	Concurrency Control : Lock-based protocols – Time stamp-based			
	protocols – Validation-based protocols – Multiple granularity – Multi-			
	version schemes - Deadlock handling.			
	Recovery System: Log-based recovery – Recovery with concurrent			
	transactions – Buffer Management.			
5	Database System Architecture: Centralized and Client-Server	10	-	2
	Architecture – Parallel Systems – Distributed Databases: Homogeneous			
	and Heterogeneous Databases – Directory System.			
Total		60	-	15

TEXT BOOKS

- 1. Abraham Silberschatz, H.F. Korth and S. Sudharshan, *Database System Concepts*, Fifth Edition, Tata McGraw Hill, New Delhi 2006.
- 2. Gerald V. Post, *Database Management Systems*, Third Edition, TATA McGraw-Hill, Third Edition 2005.

REFERENCE BOOK

1. Ramez Elmasri, Shamkant B. Navathe, *Database Systems*, Sixth Edition, Pearson Education, Delhi 2011.

2IT10 - Enterprise Resource Planning

OBJECTIVES:

- 1. To learn the importance and principles of ERP.
- 2. To learn the technologies associated with ERP and implement them using various ERP tools.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand the basic concepts, benefits and risks of ERP.
- 2. Explain the various technologies associated with ERP.
- 3. Explain the challenges behind implementing ERP and the ERP implementation strategies.
- 4. Understand the ERP softwares used to integrate business functions.
- 5. Reengineer existing business processes for successful ERP implementation using various ERP tools.

Unit	Course Content	L	Р	Т
1	 Introduction: Enterprise – An Overview – Introduction to ERP – Basic ERP Concepts – Justifying ERP Investments – Risks of ERP – Benefits of ERP ERP and Technology: ERP and Related Technologies – Business Intelligence – E-Commerce and E-Business – Business Process Reengineering (BPR) – Data warehousing – Data Mining – 	13		2
2	 ERP and Technology: On-Line Analytical Processing (OLAP) – Product Life Cycle Management – Supply Chain Management (SCM) – Customer Relationship Management (CRM) – Advanced Technology and ERP Security. ERP Implementation: Implementation Challenges – Implementation Strategies – Implementation Life Cycle – Pre-Implementation Tasks 	13	-	2
3	ERP Implementation : Requirements Definition – Implementation Methodologies – Package Selection ERP Project Teams – Process Definition – Vendors and Consultants – Dealing with Employee Resistance – Contracts with Vendors, Consultants and Employees – Training & education – Data Migration – Project Management & Monitoring – Post Implementation Activities – Success & failure Factors of an ERP Implementation	13	_	2
4	 ERP in Action: Operation and Maintenance – Measuring the Performance – Maximizing ERP System ERP Business Modules: Finance – Manufacturing – Human resources Plant maintenance – Materials Management – Quality Management – Marketing – Sales, Distribution and Service. 	13	-	2
5	The ERP Market : Marketplace and Dynamics – SAP AG – Oracle Corporation – PeopleSoft – JD Edwards – QAD Inc. – SSA Global – Lawson Software – Epicor – Intuitive ERP Present and Future : EAI, ERP and E-Business, ERP II, ERP and TQM.	13	-	2
Total		65	-	10

TEXT BOOK

1. Alexis Leon, ERP Demystified, Tata McGraw Hill Pvt. Ltd., Delhi, 2008.

REFERENCE BOOKS

- 1. Mahadeo Jaiswal, Ganesh Vanapalli, *Cloud Computing*, Jones and Bartlett India Pvt. Ltd., 2014.
- 2. Vinod Kumar Garg, N. K. Venkitakrishnan, *Enterprise Resource Planning: Concepts and Practice*, PHI Learning Pvt. Ltd, 2003.

2ITP3a - Practical III: Object Oriented Programming Laboratory OBJECTIVES:

1. To learn to code, debug and execute programs in C++ in an IDE.

OUTCOMES:

- 1. Design classes and draw class diagrams for the given problems.
- 2. Write programs in C++.
- 3. Code, debug and execute a C++ program to solve the given problems in an IDE.

#	Course Content	L	Р	Τ
	Write a class to represent a complex number which has member			
	functions to do the following			
1	a. Set and show the value of the complex number	-	6	-
	b. Add, subtract and multiply two complex numbers			
	c. Multiplying the complex number with a scalar value			
	Write a Point class that represents a 2-d point in a plane. Write member			
	functions to			
2	a. Set and show the value of a point	-	4	-
	b. Find the distance between two points			
	c. Check whether two points are equal or not			
	Design and implement a class that represents a Harmonic Progression			
	(HP). Implement functions to do the following:			
	a. Generate the HP up to a specified number of terms			
2	b. Calculate the sum of the HP to n terms and to infinity		7	
3	c. Generate the nth term of the HP	-	/	-
	d. Generate the corresponding Arithmetic Progression. (Design and			
	implement a class that encapsulates an AP, and allow the HP class			
	to use its facilities by implementing friend functions.)			
	Design and implement a class to represent a Solid object.			
	a. Apart from data members to represent dimensions, use a data			
4	member to specify the type of solid.	-	6	-
	b. Use functions to calculate volume and surface area for different			
	solids.			
	Design a class representing time in hh:mm:ss. Write functions to			
	a. Set and show the time			
5	b. Find the difference between two time objects	-	6	-
	c. Adding a given duration to a time			
	d. Conversion of the time object to seconds			
	Design a 3x3 matrix class and demonstrate the following:			
6	a. Addition and multiplication of two matrices using operator		6	
0	overloading	-	0	-
	b. Maintaining a count of the number of matrix object created			
	Design a class called cString to represent a string data type. Create a			
	data member in the class to represent a string using an array of size 100.			
	Write the following functionality as member functions:			
7	a. Copy Constructor		6	
	b. Concatenate two strings	-	0	-
	c. Find the length of the string			
	d. Reversing a string			
	e. Comparing two strings			

#	Course Content	L	Р	Т
8	 Design a class called cString to represent a string data type. Create a data member in the class to represent a string whose size is dynamically allocated. Write the following functionality as member functions: a. Copy Constructor b. Destructor c. Concatenate two strings d. Find the length of the string e. Reversing a string f. Comparing two strings 	_	8	-
9	Create a class to represent a 2-d shape and derive classes to represent a triangle, rectangle and circle. Write a program using run-time polymorphism to compute the area of the figures.	-	6	-
10	Define a class template representing a single-dimensional array. Implement a function to sort the array elements. Include a mechanism to detect and throw an exception for array-bound violations.	-	6	-
11	Demonstrate the use of the vector STL container.	-	7	-
12	Implement a telephone directory using files.	-	7	-
Tota	al	-	75	-

2ITP4a – Practical IV: Database Management Systems Laboratory

OBJECTIVES:

1. To learn to create a database of tables for a given schema, and write SQL code or PL/SQL block to implement queries / triggers on the database.

OUTCOMES:

- 1. Create a database with requisite tables, primary keys and foreign keys.
- 2. Write SQL code / PL/SQL block to implement given queries and triggers.

#	Course Content	L	Р	Τ
	Video Store database			
	Video table has the following fields: catalogNo (Text), title (Text),			
	category (Text), dailyRental (Currency), price (Currency), directorNo			
	(Text). The primary key is catalogNo.			
	Member table has the following fields : memberNo (Number), fName			
	(Text), lName (Text), gender (Char), dateOfBirth (Date/Time),			
	address (Text), mobileNo (Text). The primary key is memberNo.			
	VideoForRent table has the following fields: videoNo (Text),			
	available (Yes/No), catalogNo (Text). The primary key is videoNo.			
	RentalAgreement table has the following fields: rentalNo			
	(AutoNumber), dateOut (Date/Time), dateReturn (Date/Time),			
	memberNo, (Number), videoNo(Text). The primary key is rentalNo.			
	(For this table, set the format property for the dateOut and dateReturn			
	fields to the format dd-mmm-yy.)			
	1. Only male members of the video shop.			
	2. Only male members of the shop who joined the shop this year in			
	order of last name and first name.			
	3. All members born in the 1960s.			
	4. Only videos in the Children category with a daily rental rate of less			
	than Rs. 40 and sorted according to video title.			
1	5. Only videos currently available for rent with a certification of "A" or "U".	-	12	-
	6. Only videos by a certain director.			
	7. List the catalogNo, title and category of the Video table, ordered by video title			
	8. List title, certificate, category and dailyRental of the Video table			
	for videos in the "Childrens" category with a rental rate less than			
	Rs. 40.			
	9. List all videos with a certification of "PG" or "18" in the Video			
	table.			
	10. Create a report for your Video table containing the catalogNo,			
	title, category and certificate fields. Group your records according			
	to the values in the category field and then sort on the values in the			
	title field.			
	11. Create a report for your Video table containing the category,			
	dailyRental and price fields. Group your records according to the			
	values in the category field and then sum the values in the			
	dailyRental and price fields.			
	12. Create a report based on a query that contains the following fields			

#	Course Content	L	Р	Т
	order by videoNo.			
	13. Write a PL/SQL block that calculates the total number of videos			
	rented and number returned on a given date.			
	14. Write a trigger that is fired when a member who wants to rent a			
	video has outstanding dues.			
	Employee Database			
	Employee (EmpNo, EmpName, Gender, Salary, Address, DNo)			
	Department (DeptNo, DeptName, Location)			
	1. Employee table			
	a. Make EmpNo as Primary key			
	b. Do not allow EmpName, Gender, Salary and Address to have			
	null values			
	c. Allow Gender to have one of the two values: 'M', 'F'			
	d. Set the default salary value to Rs. 1000.			
	2. Department table			
2	a. Make DeptNo as Primary key		12	
2	b. Make DeptName as candidate key	-	12	-
	c. Make DNo of Employee as foreign key which refers to			
	DeptNo of Department			
	d. Insert few tuples into Employee and Department which			
	satisfies the above constraints.			
	e. Insert few tuples into Employee and Department which			
	violates some of the above constraints			
	f. Modify / Delete a tuple which violates a constraint			
	g. Modify the foreign key constraint of Employee table such that			
	whenever a department tuple is deleted, the employees			
	belonging to that department will also be deleted.			
	Billed (hill no number(5) million notiont no number(0) item and			
	Diffed (bill no number(3) - pri key, patient_no number(9), item_code number(5), sharge number(7.2))			
	Treatments (nby id number($(1, 2)$)			
	key procedure no number(4) - pri key date treated date - pri key			
	treat result varchar2(50))			
	Item (item code number(4) - pri key description varchar?(50)			
	normal charge number(7.2))			
	Physicians (phy id number(4) - pri key, phy phone char(8),			
	phy name varchar2(50), specialization varchar(30))			
	Patient (patient_no number(4) - pri key, date_admitted date,			
	date_discharaged_date, pat_name_varchar2(50), room_location			
3	char(4))	-	12	-
	Room (room_location char(4) - pri key, room_accomodation char(2),			
	room_extension number(4))			
	Procedures (procedure_no number(4) - pri key, proc_description			
	varchar2(50))			
	1. Get the PATIENT_NO, ITEM_CODE, and CHARGE and from			
	the BILLED table for a specific PATIENT_NO.			
	2. List all of the different charges that are stored to the table.			
	3. Display all columns and all rows from the BILLED table.			
	4. Display all charges greater than Rs. 5.00 for the PATIENT_NO			
	1110. 5 Display all shares for 14 (1116) (1117)			
	5. Display all charges for either patient 1116 or patient 1117.			
	 Display all charges for either patient 1116 or patient 1117. Count the number of times patient 1116 has been charged for 			

#	Course Content	L	P	Т
	items.			
	7. Display number of DISTINCT procedures performed on a patient.			
	8. Give a meaningful column name for number of DISTINCT			
	procedures in the above Query.			
	9. Display a calculated value such as the current charge and the			
	amount that would be charged if the charge were increased by 6%			
	for all rows in the ITEM table			
	10. List all patients hospitalized for more than 6 days			
	11. List the total charges per patient for expensive medical items			
	(CHARGE greater than Rs100 for an item) where patients owe the			
	hospital a sum (total charges over Rs500)			
	12. List the patients who had either Dr. Vaidyanathan or Dr. David or			
	Dr. Mohammed as a physician.			
	13. Show the patient names (PAT_NAME field) and associated			
	physician names (PHY_NAME field) along with the Patient			
	information			
	14. List the PATIENT_NO and DATE_DISCHARGED from the			
	PATIENT table and the associated CHARGE from the BILLED			
	table.			
	15. Write a PL/SQL block that shows the number of days for which			
	each room was occupied during a given month.			
	16. Write a trigger that lists the doctors with the same specialization,			
	which fires when a doctor newly joins the hospital.			
	Sales Processing Database			
	Client_master (client_no, name, address1, address2, city, state,			
	pincode, bal_due)			
	Product_master (Product_no, Description, Profit_percent,			
	Unit_measure, Qty_on_nand, reorder_IVI, Sell_price, Cost_price)			
	Write SQL Queries for the following:			
	1. Retrieve the list of names and clues of an the chefts.			
	2. List the various products available from the product_master table.			
	5. List all the information for alignt no 0001 and 0002			
	4. Display the information for chefit no 0001 and 0002.			
	6 Find all the products whose sell price is greater than 5000			
	7 Find the list of all clients who stay in in city 'Bombay' or city			
	'Delhi' or 'Madras'			
4	8 Find the product whose selling price is greater than 2000 and less	_	12	_
	than or equal to 5000		12	
	9 List the name city and state of clients not in the state of			
	'Maharashtra'.			
	10. Change the selling price of '1.44 floppy drive to Rs.1150.00.			
	11. Delete the record with client 0001 from the client master table.			
	12. Change the city of client no'0005' to Bombay.			
	13. Change the bal due of client no '0001, to 1000.			
	14. Find the products whose selling price is more than 1500 and also			
	find the new selling price as original selling price *15.			
	15. Find out the clients who stay in a city whose second letter is a.			
	16. Find out the name of all clients having 'a' as the second letter in			
	their names.			
	17. List the products in sorted order of their description.			
	18. Count the total number of orders			

#	Course Content	L	Р	Т
	19. Calculate the average price of all the products.		-	-
	20. Calculate the minimum price of products.			
	21. Determine the maximum and minimum prices . Rename the tittle			
	as 'max price and min price respectively.			
	22. Count the number of products having price greater than or equal to			
	1500.			
	Banking database			
	account (account_number, branch_name, balance)			
	branch (branch_name, branch_city, assets)			
	customer (customer_name customer_street, customer_city)			
	loan (loan_number, branch_name, amount)			
	depositor (customer_name, account_number)			
	borrower (customer_name, loan_number)			
	1. List all branch names and their assests			
	2. List all accounts of Brooklyn branch			
	3. List all loans with amount > 1000 .			
	4. List all accounts of Perryridge branch with balance < 1000.			
	5. List Numbers of accounts with balances between 700 and 900			
	6. Change the assests of Perryridge branch to 340000000.			
	7. Transfer the accounts and loans of Perryridge branch to Downtown			
	branch.			
	8. Transfer Rs. 100 from account A-101 to A-215.			
	9. Delete the branch Perryridge.			
	10. Waive off all the loans with amount < 1000 .			
	11. Delete the accounts and loans of Downtown branch.			
	12. Add a column phoneNo to customer table.			
	13. Change the size of the branch_city to varchar(20).			
	14. Drop the column phoneNo from customer table.			
5	15. For all customers who have a loan from the bank, find their names,	-	27	-
	Ioan numbers, and Ioan amount.			
	16. Find the customer names, Ioan numbers, and Ioan amounts, for all			
	Ioans at the Perryridge branch.			
	and loop numbers with the attribute loop number replaced by			
	loan id			
	18 Find the names of all branches that have assets greater than atleast			
	one branch located in Brooklyn			
	19 Find the names of all customers whose street address includes the			
	substring 'Main'.			
	20. List loan data, ordered by decreasing amounts, then increasing			
	loan numbers. (Use union all to retain duplicates)			
	21. Find all the bank customers having a loan, an account, or both at			
	the bank. (Use intersect all to retain duplicates)			
	22. Find all the bank customers having both a loan and an account at			
	the bank.			
	23. Find all customers who have an account but no loan at the bank.			
	24. Find the average account balance at the Perryridge branch.			
	25. Find the average account balance at each branch.			
	26. Find the number of depositors for each branch (Use distinct).			
	27. Find those branches where the average accounts balance is more			
	than Rs. 1200.			
	28. Find the number of branches of the bank.			

#	Course Content	L	Р	Т
	29. Find the average balance for each customer who lives in Harrison			
	and has at least three accounts.			
	30. Find all loan numbers that appear in the loan relation with null			
	values for amount.			
	31. Find all the customers who have both a loan and an account at the			
	Perryridge branch.			
	32. Find all customers who do have a loan at the bank, but do not have			
	an account at the bank.			
	33. Select the names of customers who have a loan at the bank, and			
	whose names are neither Smith nor Jones.			
	34. Find the names of all branches that have assets greater than those			
	of at least one branch located in Brooklyn.			
	35. Find the names of all branches that have an asset value greater			
	than that of each branch in Brooklyn.			
	36. Find all customers who have both an account and a loan at the			
	bank			
	37. Find all customers who have an account at all the branches located			
	in Brooklyn.			
	38. Find all customers who have at most one account at the Perryridge			
	branch.			
	39. Find all customers who have at least two accounts at the perryridge			
	branch			
	40. Find the average account balance of those branches where the			
	account balance is greater than Rs. 1200.			
	41. Find the maximum across all branches of the total balance at each			
	branch.			
	42. Select the accounts with maximum balance.			
	43. Find all branches where the total account deposit is greater than			
	the average of the total account deposits at all branches.			
	44. Create a view all_customers consisting branches and their			
	customers. Select all the customers from all_customers view.			
	45. Create a view Perryridge_customers consisting customers of			
	A polate all loops with loop amounts between P_{0} 1200 and P_{0}			
	40. Delete an loans with loan amounts between KS. 1500 and KS,			
	1300. 47 Delate all account tuples at every branch located in Brooklyn			
	47. Delete all account tuples at every branch located in brooklyn.			
	customers of Perryridge branch(Note: It requires insert into			
	account and depositor)			
	49 Pay 5% interest to all accounts with a balance of Rs 1000 or more			
	50 Pay 5% interest on accounts whose balance is greater than average			
	51. Pay 6% interest on accounts with balances over Rs. 10000 whereas			
	pay 5% interest on all other accounts.			
	52. List the customer names along with the length of the customer			
	names			
	53. List the customer names in lower case			
	54. List the customer names and 3 characters from 3rd position of each			
	customer name			
	55. List the customer names in upper case			
	56. List the balance and balance/3 rounded to nearest hundred from			
	account.			
	57 Display the birth date of all the employees in the following format:			

-				
#	Course Content	\mathbf{L}	Р	Т
	DD-MON-YYYY', 'DD-MON-YY', 'DD-MM-YY'			
	58. List the employee names and the year(fully spelled out) in which they born			
	59. List the employee names and the day(of the week fully spelled out) in which they born			
	60. List the employee names and the month(fully spelled out) in which they born			
	61. Find the last day of the month(and its day of the week) in which employee Mr. X is born			
	62. Find the age of all the employees			
	63. List the employees whose birth day falls in the given year X			
	64. List the employees whose birth day fall between the given years X and Y			
	65. List the employees who will retire on the given year X.			
	66. Write a PL/SQL code block that will accept an account number			
	from the user and debit an amount of Rs. 2000 from the account if			
	the account has a minimum balance of 500 after the debit. The			
	process is to be fired on the account table.			
Total		-	75	-

Semester III

3IT11a – Internet Programming

OBJECTIVES:

- 1. To learn socket programming, servlet programming and the use of integrated platforms to develop advanced Java applications.
- 2. To learn to write simple programs using servlets, Javabeans, spring, RMI and JSP.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Explain basics features and write programs using socket programming.
- 2. Write programs using JDBC.
- 3. Explain the basic concepts of servlets.
- 4. Understand applet-servlet, HTML-servlet communication and write programs.
- 5. Understand the concept of Java Beans and write simple programs.
- 6. Understand the basic concepts of Spring and build simple apps using Spring MVC.
- 7. Explain the concept of RMI & protocols used and write simple programs using RMI.
- 8. Explain basic concepts and protocols of JSP, and write simple programs.

Unit	Course Content	L	P	Τ
1	Java Basics: I/O Streams – File Streams – Applets - Socket Programming – Proxy Servers – TCP/IP Sockets – Net Address – URL - JDBC connectivity.	10	-	2
2	 Servlets: Overview of servlets – The Java web server - Session management – HTML forms – using JDBC in servlets – Applet to Servlet communication. Java Beans: The software component assembly model - The java beans development kit - developing beans - Application Builder tool- JAR files – Introspection - Bound Properties – Persistence - customizers – Java Beans API. 	15	-	2
3	 Spring Application Framework Core Spring: Springing into action - Wiring beans - Minimizing XML configuration in Spring - Aspect-oriented Spring. Spring Application Essentials: Hitting the database - Managing transactions - Building web applications with Spring MVC. 	15	-	2
4	Remote Method Invocation: Overview of RMI – Developing applications with RMI: Declaring & Implementing remote interfaces - stubs & skeletons, Registering remote objects, writing RMI clients – Pushing data from RMI Servlet – RMI over Inter-ORB Protocol.	10	-	2
5	Java Server Pages: Introduction JSP - Examining MVC and JSP – JSP scripting elements & directives - Working with variables scopes - Error Pages - using Java Beans in JSP - Working with Java Mail - Understanding Protocols in Java mail – Components - Java mail API.	15	-	2
Total		65	-	10

TEXT BOOKS

- 1. H. Schildt, Java 2 Complete Reference, 5th Edition, TMH, New Delhi, 2002.
- 2. J. McGovern, R. Adatia, Y. Fain, J2EE 1.4 Bible, Wiley-Dreamtech India P Ltd, 2003.
- 3. Craig Walls, Spring in Action, Manning Publications Company, 2011.

REFERENCE BOOKS

- 1. K. Moss, Java Servlets, Second Edition, Tata McGraw Hill, New Delhi, 1999.
- 2. Joseph O'Neil, Java Beans from the Ground Up, Tata McGraw Hill, New Delhi, 1998.
- 3. TomValesky, Enterprise JavaBeans, Addison Wesley.
- 4. Cay S Horstmann, Gary Cornell, Core Java Vol II Advanced Features, A-W, 2007.

3IT12b – Personal Software Process

OBJECTIVES:

- 1. To learn the concept of software process and PSP.
- 2. To learn the various phases in a software project and the importance of planning.
- 3. To learn the key software metrics.
- 4. To learn the basics of software quality management.
- 5. To learn the Agile Process Model.

OUTCOMES:

- 1. Understand the concepts and importance of software process and the application of PSP.
- 2. Explain the basics of project planning.
- 3. Describe the important metrics used in measuring software size, and estimating software size, resources and schedule.
- 4. Estimate software size using function point method and PROBE size estimating method.
- 5. Articulate the important PSP metrics in the GQM paradigm.
- 6. Explain the concepts involved in software quality including benchmarking, yield management and defect removal and prevention.
- 7. Describe the aspects of design and code reviews in the software process.
- 8. Understand the Agile Process Model.

Unit	Course Content	L	P	Τ
1	 The Personal Software Process Strategy: The logic for a Software Engineering discipline – The definition of a software process – Process maturity – The PSP strategy – The logic for PSP – Productivity and the PSP. The Baseline Personal Process: The baseline process – The PSP process elements – The PSP0 Process – PSP0 measures – Time recording log – Defect recording log - PSP0 Project plan summary – Customizing the initial process. Introduction to Planning: The 'why' and 'what' of a plan – Contents of a software plan – Planning a software project – Producing a quality plan. 	10	_	-
2	 Measuring Software Size: Size measures – A size measurement framework – Establishing a counting standard – Using LOC counts – Reuse considerations – LOC accounting – Calculating productivity – LOC counters. Estimating Software Size: Popular estimating methods – Proxy-based estimating – The PROBE size estimating method – Object categories – Estimating considerations. 	12	-	4
3	 Resource and Schedule Estimating: Resource Planning – Estimating development time – Estimating task time – Combining multiple estimates – Using multiple regression – Schedule estimating – Earned value tracking – Estimating accuracy. Measurements in the PSP: Overview – Fundamental process measures – Goal-Question-Metric (GQM) paradigm – General PSP objectives, goals and questions – Example of GQM – Gathering data – The impact of data gathering – Establishing a baseline for the personal process. 	13	_	5

Unit	Course Content	L	P	Т
4	Design and Code Reviews: The 'what' and 'why' of reviews – Personal reviews – Review principles - Relationship between reviews and inspections. Software Quality Management: Meaning of software quality – The	10	I	2
	economics of software quality – Developing a quality strategy – Process benchmarking – Yield management – Defect removal strategies – Defect prevention strategies.			
5	 Software Design: The Design process – Design quality – Structuring the design process – Design notation – Design templates – The Functional Specification – The functional, state and logic specification templates – Operational scenario template – using templates in Design – Design guidelines. Defining the Software Process: Need for definition of software processes – Software process basics – Process definition – Defining process phases – Process development considerations – Process evolution – The Process: What is Agility – What is an Agile process – Agile Process Models: Extreme Programming, Adaptive Software Development, Dynamic Systems Development Method, Scrum, Crystal, Feature Driven Development, Agile Modeling. 	15	-	4
Total		60	-	15

TEXT BOOKS

- 1. Watts S. Humphrey, A Discipline for Software Engineering, Pearson Education Inc., 2012.
- 2. Roger Pressman, *Software Engineering A Practitioner's Approach*, 6th Edition, Tata McGraw Hill, 2010.

REFERENCE BOOK

1. Watts S. Humphrey, *Introduction to the Personal Software Process*, Pearson Education, 2000.

3IT13a – Data Mining

OBJECTIVES:

- 1. To appreciate the types of problems for which Data Mining is used.
- 2. To learn the various issues involved in Data Mining, and how to handle them.

OUTCOMES:

- 1. Understand the concept of data discovery in various types of databases, and the need for data mining.
- 2. Understanding the various methods of data preprocessing.
- 3. Understand the need for data reduction and strategies to perform data reduction.
- 4. Learn the rules and algorithms involved in association rule mining.
- 5. Understand supervised and unsupervised learning techniques, including classification, prediction, clustering and outlier analysis.
- 6. To understand the concepts of web mining and spatial data mining.

Unit	Course Content	L	Р	Τ
1	Introduction : Data Mining tasks – Data Mining versus Knowledge Discovery in Data bases – Relational databases – Data warehouses – Transactional databases – Object oriented databases – Spatial databases – Temporal databases – Text and Multimedia databases – Heterogeneous databases - Mining Issues – Metrics – Social implications of Data mining.	8	-	2
2	 Data Preprocessing: Why Preprocess the data – Descriptive data summarization-Data cleaning – Data Integration – Data Transformation. Data Reduction Strategies: Data cube aggregation - Attribute subset Selection – Dimensionality Reduction - Data Compression Numerosity Reduction – Clustering - Sampling. 	14	-	2
3	Association Rule Mining: Basic concept and road map – Mining Single Dimensional Association Rules: The Apriori Algorithm – Improving efficiency of Apriori algorithm - Multilevel Association Rules: Approaches to mining Multilevel Association Rules – Multidimensional Association Rules using Static discretization of quantitative attributes – Constraint Based Association Mining.	14	_	2
4	 Classification Techniques: Issues regarding Classification and Prediction – Classification by Decision Tree induction – Bayesian Classification – Classification by Backpropagation – Classifiers accuracy: Estimating Classifier Accuracy. Prediction Techniques: Linear Regression Model - Multiple Regression Model - Non Linear Regression Model - Other regression Models. 	14	-	2
5	 Cluster Analysis: Categorization of major Clustering Methods – Classical Partitioning Clustering Method: K-Means method, K-Medoid Method - Hierarchical Clustering Methods: Agglomerative Hierarchical Clustering, Decisive Hierarchical Clustering Methods – Density Based Clustering Methods: DBSCAN. Outlier Analysis: Statistical Distribution based outlier detection - Distance based outlier detection. Overview of Advanced Topics: Web Mining - Spatial Data mining. 	15	_	2
Total		65	-	10

TEXT BOOK

1. Jiawei Han, Micheline Kamber, *Data Mining Concepts and Techniques*, Second Edition, Elsevier, 2006.

REFERENCE BOOKS

- 1. Margaret H. Dunham, Data Mining Introductory and Advanced Topics, Pearson, 2006.
- 2. S. N. Sivananda, S. Sumathi, Data Mining, Thomson Learning, Chennai, 2006.

3IT14 - Web Application Development

OBJECTIVES:

- 1. To understand the difference between server-side and client-side programming.
- 2. To learn HTML5 for designing web pages and Java script for client-side programming.
- 3. To learn XML to represent data and create user-defined tags.
- 4. To learn the concepts of Web 2.0 and ASP.NET.
- 5. To learn programming in C#.
- 6. To learn to interface databases with the web application using ADO.NET.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Explain the features of HTML 5 and create web pages.
- 2. Understand the features of Javascript and write simple scripts.
- 3. Represent web data and create user-defined tags using XML.
- 4. Explain the various ways to parse XML files.
- 5. Explain the various features of C# and ASP.NET and develop simple web applications.
- 6. Explain the concepts of ADO.NET.
- 7. Write code to interface a web application with a database using ADO.NET.
- 8. Identify bugs in a C# code snippet and fix them.
- 9. Determine the output of a given C# code snippet.

Unit	Course Content	L	P	Т
	Introduction to Scripting: Need for scripting - Script vs programming			
	language - Client-side and server-side scripting.			
	HTML 5: Introduction to HTML 5 – Introduction to New elements –			
1	Working with Lists, Tables and Frames – Working with hyperlink and	11	-	2
	images- Working with Forms and Controls			
	JavaScript: Structures – Variables – Operators - Conditional and			
	looping structures - Popup boxes – Functions – Events - Cookies.			
	Introduction to XML: Fundamentals of XML Syntax - Namespaces -			
2	XML validation: DTD, XML Schema.	14	-	2
	X-Files: XPATH – XQUERY – XLINK – XPOINTER.			
	Introduction to C#: Overview of C# - Data Types, Literals, Variables			
3	and Operators - Classes, Objects, Methods - Operator Overloading -	14	-	2
	Indexers and Properties - Interfaces, Structures and Enumerations.			
	ASP.NET: The .NET Framework - Using Namespaces - Setting up			
4	ASP.NET and IIS - ASP.NET Applications - Web Form Fundamentals	13	-	2
	- Web Controls - Validation and Rich Controls.			
5	Working with Data: ADO.NET Data Access - Data Binding -			
	DataList, DataGrid and Repeaters – Files, Streams and Emails.	13	-	2
	Advanced ASP.NET: Implementing Security.			
Total		65	-	10

- 1. Ivan Bayross, Web Enabled Commercial Application Development using HTML, DHTML, JavaScript and Perl CGI, BPB Publications, 2002.
- 2. Daniel Read, Adrian Kingsley Hughes, *VB Script Programmer's Reference*, 2nd Edition, Wiley India Pvt. Ltd., 2009.

- 3. Kogent Learning Solutions Inc, HTML 5 in Simple Steps, Dreamtech press.
- 4. Ron Schmelzer, XML and Web Services, Pearson Education, 2008.
- 5. Herbert Schildt, *The Complete Reference C#*, Tata McGraw-Hill, 2002.
- 6. Matthew MacDonald, ASP.NET: The Complete Reference, Tata McGraw-Hill, 2010.

REFERENCE BOOKS

- 1. Greg Buczek, ASP.NET Developer's Guide, Tata McGraw-Hill, 2008.
- 2. David Hunter, Jeff Rafter, Beginning XML, 4th Edition, Wiley Eastern, 2007.

REFERENCE WEBSITES:

- 1. www.w3schools.com
- 2. www.functionx.com

Elective I

#	Elective Stream	Elective I
1	Communication Systems	Stream 1: 3ITE1WT – Wireless Technology
2	Security Systems	Stream 2: 3ITE1CR - Cryptography and Network
3	High-performance Computing	Stream 3: 3ITE1PC – Parallel Computing
4	Software Testing	Stream 4: 3ITE1ST – Foundations of Software Testing and Ouality Assurance

3ITP5a - Practical V: Web Applications Development Laboratory

OBJECTIVES:

1. To design interactive web pages using Javascript, HTML 5, XML, C# and ASP.NET.

OUTCOMES:

- 1. Design web pages using HTML5 and Java script.
- 2. Represent web data using XML while creating websites.
- 3. Code, debug and execute a C# program to solve the given problems using the .NET framework.
- 4. Develop simple web application using ASP.NET controls.
- 5. Interface a .NET web application to a database using ADO.NET.

#	Course Content	L	Р	Т
1	 HTML5: 1. Create a HTML program using frames to generate your own creativity. 2. Create a website as a collection of HTML pages which gives details about you. Have a homepage which has links of Personal information, Favourites, Academic excellence and any such information you want to post about yourself. The design, look and feel of the page can be designed by you. 3. Create a HTML table for Student information system. It must contain, columns for Register Number, Name, Marks, Total, Percentage. 	_	12	_
2	 JavaScript: Write a JavaScript to create an array of elements, accept the values and display the same. Write a JavaScript that creates a document that opens a new explorer window without a toolbar, address bar and status bar, and that unloads itself after one minute. Create a web page that will create a cookie with the details of the user and his favourite colour. When the same username is given the next time, the colour detail should be retrieved from the cookie and displayed. 	-	12	_
3	 XML: Create an XML document that lists 5 books in a bookstore with the following details about each book – title of the book, author, year and price. Validate using Internal DTD. Create an XML document that lists at least 10 items in a shopping mall with the following details about each item – Product name, Brand name, Description, Category, Popularity rating and Cost. Validate using External DTD. Create an XML document that lists the desktop and laptop models available in a computer showroom. The details expected for each item : Product name, Product code, Company, Configuration (Processor No., Processor speed, Motherboard model, HD, RAM, Accessories list). Validate using XML Schema. 	-	17	_

#	Course Content	L	Р	Τ
4	 C#: 1. Develop a program to demonstrate the concepts of boxing and unboxing. 2. Write a program using while construct and indexer property to display the content of a string object. 3. Design a structure data type named DateOfBirth to contain date, month and year of birth. Develop a C# program using this data structure that would assign your date of birth to the individual members and display the date of birth in the format, dd/mm/yy. Do not use any methods in the program. 	_	17	-
5	 ASP.NET: 1. Develop a simple web application to create a sign-in form. 2. Develop a simple web application to create a file manager form. 3. Develop a simple web application for online library. 	-	17	-
Total		-	75	-

3ITP6c - Practical VI: Internet Programming Laboratory

OBJECTIVES:

1. To learn to code, debug and execute simple programs using servlets, Javabeans, spring, RMI and JSP using IDE.

OUTCOMES:

- 1. Implement socket programming and Client side scripting in Java.
- 2. Develop Java program using JDBC.
- 3. Design a web application to demonstrate HTML and applet communication with servlet.
- 4. Implement simple programs using spring.
- 5. Write code to connect client with remote server using RMI.
- 6. Develop simple applications using JSP.

#	Course Content	L	Р	Т
1	Write a Java program to implement the usage of Socket programming.	-	8	-
2	 JDBC: Write a Java program to create a student database and do the following using JDBC. a. Insert b. Delete c. Modify d. Display 		7	-
3	Create a web application with personal details of an employee that demonstrates HTML-to-Servlet communication.	-	6	-
4	Demonstrate Applet-to-Servlet communication that displays the day and time from the Servlet.	-	6	-
5	Create a login page which redirects to a Servlet page that displays the session id for the user.	-	6	-
6	Design a web application with Servlet for inserting and viewing the details of an employee database.	-	6	I
7	Given the cost of 5 items and a discount percentage, display the discounted value of all the items using Spring.	-	5	I
8	Demonstrate simple calculations with RMI.	I	6	-
9	Write a program to reverse a given string using RMI.	I	6	-
10	Write a program to display the student details from the database. Use JSP.	-	6	-
11	Design an online quiz application with JSP.	-	6	-
12	Develop a web application to validate an e-mail id in a text field using a Java Bean in JSP.	-	7	-
Total		-	75	-

Semester IV

4IT16 – Business Enterprise Architecture and Green IT

OBJECTIVES:

- 1. To learn the concepts of Enterprise Architecture and how it enables an organization to accomplish its business goals.
- 2. To learn the concepts and methods of Green IT to develop environmentally responsible Enterprise Architecture.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Describe the fundamental concepts and applications of Enterprise Architecture.
- 2. Understand Business Process Modelling and SOA.
- 3. Explain the infrastructure for building an enterprise architecture.
- 4. Understand the goals, policies, assets, standards & optimization methods for Green IT.
- 5. Understand the Socio-cultural aspects of Green IT, its protocols and standards.
- 6. Understand how to apply Green IT strategies and applications through case studies.

Unit	Course Content	L	Р	Т
	The Logical Level of Enterprise Architecture: Enterprise			
1	Architecture and Technology Trends - Enterprise Architecture goals,	15		2
1	roles and mechanisms - The Open Group Architectural Framework –	15	-	2
	Official Enterprise Architecture standards.			
2	Tools and Modeling: Tools – Business Process Modeling –	15		2
2	Architecture Fulfilment via SOA Modeling.	15	-	2
	The Infrastructure Level of Enterprise Architecture: Evolving			
	SAN, Gbe/10Gbe and Metro Ethernet technologies – Evolving			
3	WAN/MAN technologies – Networking in SOA environments –	15	-	2
	Server/storage utilization and grid computing for commercial enterprise			
	environments.			
	Green IT Fundamentals: Business, IT, and the Environment - Green			
	IT Strategies : Drivers, Dimensions and Goals - Environmentally			
	Responsible Business: Policies, Practices, and Metrics.			
4	Green Assets and Modeling: Green Assets: Buildings, Data Centers,	10		2
4	Networks and Devices - Green Business Process Management:	10	-	2
	Modeling, Optimization, and Collaboration - Green Enterprise			
	Architecture, Environmental Intelligence, Green Supply Chains -			
	Green Information Systems: Design and Development Models.			
	Green Compliance: Socio-cultural aspects of Green IT – Green			
	Enterprise Transformation Roadmap – Green Compliance: Protocols,			
	Standards, and Audits – Emergent Carbon Issues: Technologies and the			
5	future.	10	-	2
	Case Studies: The Environmentally Responsible Business Strategies			
	(ERBS) - Applying Green IT Strategies and Applications: Hospital,			
	Packaging Industry, Telecom Sector.			
Total		65	-	10

- 1. Daniel Minoli, Enterprise Architecture A to Z Frameworks, Business Process Modeling, SOA, and Infrastructure Technology, CRC Press, 2008.
- 2. Bhuvan Unhelkar, Green IT Strategies and Applications Using Environmental Intelligence, CRC Press, June 2011

REFERENCE BOOKS

- 1. Wing Lam, *Enterprise Architecture and Integration*, IGI Global, 2007.
- 2. Woody Leonhard, Katherrine Murray, Green Home Computing for Dummies, August 2009.
- 3. Alin Gales, Michael Schaefer, Mike Ebbers, Green Data Center: Steps for the Journey, Shoff/IBM rebook, 2011.
- 4. John Lamb, *The Greening of IT*, Pearson Education, 2009.
- 5. Carl Speshocky, Empowering Green Initiatives with IT, John Wiley & Sons, 2010.

4IT17 – Mobile Application Development

OBJECTIVES:

- 1. To learn the components and structure of mobile application development frameworks for Android OS based mobiles.
- 2. To learn how to develop simple android applications.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand the basics of Android devices and the Android platform.
- 2. Explain the basic building blocks of Android programming required for App development.
- 3. Explain the components used in Activity Life Cycle.
- 4. Understand how to create basic user interfaces with layouts, views and fragments.
- 5. Explain persistence and data storage mechanism in Android.
- 6. Describe advanced application concepts like Networking, Animations and Google Maps services.
- 7. Develop and publish Android applications to Android Market.

Unit	Course Content	L	P	Т
1	 Introduction to Android: Getting Started with Android : Android Versions - Features - Architecture of Android - Examples of Android Devices - Tools : Android Studio, Android SDK, Creating Android Virtual Devices, Android Developer Community - Creating First Application. Using Android Studio: Exploring the IDE - Debugging Android Application : Setting Breakpoints, Navigating Paused Code - Publishing the Application. 	11		2
2	Android User Interfaces: Understanding Activities – Linking Activities using Intents – Fragments – Displaying Notifications – Components of a Screen – Display Orientation – Managing Screen Orientation : Persisting State Information during changes in Configuration – Utilizing Action Bar.	14	-	2
3	Views: Basic Views – Picker Views – List Views – Image View – Using Menus with Views. Basic Android Development: Audio playback, Photo capture.	14	Ι	2
4	Advanced Android Development: Animations – Publishing – Messaging : SMS Messaging, Sending Email – Location-Based Services – Data Persistance : Persisting data to Files, Creating and using Databases.	16	-	2
5	Advanced Topics: Distribution and Monetizing, Networks : Managing Network and Internet Connectivity, Security: Mobile Malware.	10	-	2
Total		65	-	10

TEXT BOOKS

1. J.F.DiMarzio, Beginning Android Programming with Android Studio, Wrox Press, 4th Ed.

2. Reto Meier, Professional Android Application Development, Wrox Press, 2009.

3. Himanshu Dwivedi, Chris Clark, David Thiel, *Mobile Application Security*, TMH, 2010. WEB REFERENCES

- 1. http://developer.android.com
- 2. http://www.html5rocks.com/en/mobile
- 3. http://mobilehtml5.org/

Elective II

#	Elective Stream	Elective II
1	Communication Systems	Stream 1: 4ITE2SC – Satellite Communication
2	Security Systems	Stream 2: 4ITE2BS - Biometric Systems
3	High-performance Computing	Stream 3: 4ITE2GC – Grid Computing
4	Software Testing	Stream 4: 4ITE2ST – Software Testing

4ITP7a - Practical VII: Mobile Application Development Laboratory OBJECTIVES:

1. To learn to code, debug and run Android Apps using Android Studio.

OUTCOMES:

- 1. Write programs to create Android Apps.
- 2. Code, debug and run the programs.
- 3. Create Apps for the given problems through Android programming.
- 4. Design and develop simple Android Apps.

Unit	Course Content		Р	Т
1	Create a Hello World App. Run the app on the emulator and on the Physical Device.	-	2	-
2	Create an app to accept the user's name and to greet him/her.	-	4	-
3	Develop an App named AppRater that suggests other Applications for users to download and try. The purpose of the application is to share fun and interesting applications with other users. The users can then rate the applications.	-	4	-
4	Develop an App to select a set of items from the given list using the Check Box component. The application is used to place an order once the items are selected.	-	4	-
5	Create an App with two different Activities using the user interface, Intent. Run the app on the emulator which allows the user to navigate from one activity to the other once a button is clicked.		4	-
6	Design an App using the List View Component to add desired items to a list.	-	7	-
7	Demonstrate an App using Menu groups in Android.	-	6	
8	Create an Application to demonstrate a Radio group button in Android.	I	6	
9	Develop an App to demonstrate the Time picker dialog in Android.	-	6	
10	Develop an app with two buttons named Save and Load using the concept of Internal Storage. Create a file by specifying its name. File must be saved and loaded when the appropriate buttons are clicked.		8	-
11	Develop an Application with a button called Send to send text messages from one device to another using the SMS Action in Android.	-	8	-
12	Create an Internet Connection app. Run the app on the emulator to check whether the emulator is connected to the network or not.		6	
13	Create a simple Animation App with an Image View icon to perform following activities i. Zoom In/ Zoom Out ii. Clockwise/AntiClockwise iii. Move iv. Fade v. Blink		10	
Total	1	-	75	-

4ITPR - Project Work

OBJECTIVES:

1. To gain real-time experience in software project development in a production environment.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand how to execute a software project from scratch to delivery and deployment.
- 2. Understand the various processes involved in the engineering of software through practical implementation.
- 3. Understand how to develop a software solution for the given large problem.
- 4. Write a project report that incorporates all the stages of software engineering and processes involved in the project.

4ITPV - Project Viva-voce

OBJECTIVES:

1. To learn to present project work done.

OUTCOMES:

- 1. Understand how to make an effective presentation of the project work.
- 2. Explain the project work and answer technical questions on the work done.

Elective I

Stream 1: 3ITE1WT – Wireless Technology

OBJECTIVES:

- 1. To learn the architecture, transmission techniques and principles behind working of wireless networks.
- 2. To learn the fundamentals of different wireless technologies.

OUTCOMES:

- 1. Understand the basic concepts and characteristics of wireless networks.
- 2. Explain the different transmission techniques.
- 3. Understand the principles behind wireless network operation.
- 4. Describe the basic concepts and mechanisms of wireless LAN, WAN, ATM HIPERLAN, WPAN.
- 5. Explain the architecture, technologies and performance measures of wireless geolocation systems.

Unit	Course Content	L	Р	Т
1	Introduction: Introduction to Wireless Networks - Different Generations of Wireless Networks Characteristics of the Wireless Medium: Introduction – Radio Propagation Mechanisms – Path - Loss Modeling and Signal Coverage – Effects of Multipath and Doppler - Channel Measurement and Modeling Techniques – Simulation of the radio Channel.	10	-	2
2	 Physical Layer Alternatives for Wireless Networks: Applied Wireless Transmission Techniques - Short distance Base Band Transmission - UWB Pulse Transmission – Carrier modulated Transmission – Digital Cellular Transmissions – Broadband Modem for Higher Speed - Spread spectrum Transmissions - High speed modems for spread spectrum Technology - Diversity and Smart receiving Techniques – Comparison of Modulation Schemes - coding Techniques for wireless Transmissions. Wireless Medium Access Alternatives: Fixed Assignment Access for Voice – Oriented Networks - Random access for data oriented Networks – Integration of Voice and Data Traffic. 	15	_	2
3	Principles of Wireless Network Operation: Network Planning – Wireless Network Topologies – Cellular Topology – Cell Fundamentals – Signal to Interference Ratio Calculation – Capacity Expansion Techniques – Network Planning for CDMA Systems - Wireless Network operation - Mobility Management – Radio Resources and Power Management – Security in Wireless Networks Wireless WANs: Introduction to GSM – Mechanisms to support a mobile environment – communications in the infrastructure – CDMA Technology, IS-95 and IMT – 2000 – Mobile Data Networks - Data oriented CDPD Network – GPRS and Higher data rates – SMS in GSM – Mobile Application Protocols.	14	_	2

Unit	Course Content	L	P	Т
4	Wireless LANs: Introduction to Wireless LANs – Historical Overview of the LAN Industry – Evolution of the WLAN Industry – Wireless Home Networking – IEEE 802.11 – The PHY Layer – MAC Sub layer – MAC Management Sub layer Wireless ATM and HIPERLAN: Wireless ATM – HIPERLAN – HIPERLAN-2	13	-	2
5	Ad Hoc Networking and WPAN: IEEE 802.15 WPAN – Home RF – Bluetooth – Interference between Bluetooth and 802.11 Wireless Geolocation Systems: Wireless Geo location - Wireless Geo location System Architecture - Technologies for Wireless Geo location - Geo location Standards for E-911 Services – Performance measures for Geo location Systems	13	-	2
Total		65	-	10

TEXT BOOK

1. Kaveh Pahlavan, Prashant Krishnamurthy, *Principles of Wireless Networks*, Pearson Education, Delhi, 2004.

REFERENCE BOOKS

- 1. Theodre S. Rappaport, *Wireless Communications: Principles and Practice*, Pearson Education, Delhi, 2002.
- 2. William Stallings, *Wireless Communications and Networks*, Pearson Education, Delhi, 2002.
- 3. Martyn Mallick, Mobile and Wireless Design Essentials, Wiley, 2003.
- 4. Kamilia Feher, Wireless Digital Communications, Prentice Hall of India, Delhi, 2002.

Stream 2: 3ITE1CR - Cryptography and Network Security

OBJECTIVES:

- 1. To learn the important role of cryptography in network security.
- 2. To study the mathematical concepts required for understanding the algorithms/techniques of cryptography.
- 3. To understand public key encryption standards and algorithms.
- 4. To learn the importance of network security, its principles and security protocols.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Learn of various encryption techniques from classical to modern.
- 2. Understand the important aspects of number theory used in cryptography.
- 3. Understand the RSA algorithm and connected protocols.
- 4. Learn the importance of message authentication and understand the secure hash algorithm.
- 5. Describe the technique, protocols and standards for digital signature.
- 6. Explain the concept and types of user authentication, and Kerberos concepts.
- 7. Describe the various internet security services.

Unit	Course Content	L	Р	Т
1	Introduction: Basic Terminologies – Generic Model for Secure Communication – Requirements of Secure Communication – OSI Security Architecture X.800 – Categories of Cryptographic Systems – Symmetric Encryption Model – Classical Substitution Ciphers.	8	-	2
2	Mathematical Foundations of Cryptography: Introduction to Group, Ring and Field – Modular Arithmetic – Primes and Co-Primes – Euclid's Algorithm for GCD – Extended Euclid's Algorithm – Galoi's Finite Fields – Fermat's Little Theorem – Euler's Totient Function – Euler's Theorem – Prime Numbers – Discrete Logarithms – Primality Testing – Chinese Remainder Theorem.	17	_	2
3	Modern Symmetric Ciphers: Basic Concepts of Symmetric Ciphers – Claude Shannon's Theory of Diffusion and Confusion – Fiestel Cipher – DES – Avalanche Effect – Multiple DSE – Avalanche Effect – Multiple DES – IDEA – AES – Key Management Public-Key Cryptography: Requirements – Data Confidentiality using PKC – RSA Algorithm – Strength of RSA – Key Management.	14	_	2
4	AuthenticationSchemes:TypesofAuthenticationServices–ApplicationModes ofDigitalSignatures–AuthenticationProtocols–MessageDigestHashFunctionAlgorithm–SHA-1–DigitalSignatureSchemes.CentralizedAuthenticationService:SimpleAuthenticationExchangeinOpenEnvironment–KERBEROSV.4–Inter-KerberiAuthenticationSequence–PKI X.509.KerberiKerberi	16	-	2
5	Pretty Good Privacy: Services Supported – R64 Transformation – Public Key Ring and Private Key ring in PGP – S/MIME. Internet Security Services: IPSec – Services Provided by IPSec – ISAKMP – SSL/TLS – SET.	10	-	2
Total		65	-	10

TEXT BOOK

1. P. S. Gill, *Cryptography and Network Security*, MacMillan Publishers India Ltd., 2011. REFERENCE BOOK

1. Atul Kahate, Cryptography and Network Security, Tata McGraw Hill, 2008.

Stream 3: 3ITE1PC – Parallel Computing

OBJECTIVES:

1. To learn the design principles, architectures, network topologies and basic programming paradigms for parallel computing.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand the various parallel computer models, issues and architectures.
- 2. Understand the design principles of processors for various parallel computing architecture.
- 3. Describe the various network topologies used for parallel computing.
- 4. Explain the programming models for parallel computing.

Unit	Course Content	L	P	Т
1	Scalability and Clustering: Evolution of Computer Architecture – Dimensions of Scalability – Parallel Computer Models – Basic Concepts of Clustering – Scalable Design Principles – Parallel Programming Overview – Processes, Tasks and Threads – Parallelism Issues – Interaction / Communication Issues – Semantic Issues in Parallel Programs Pipelining and Super scalar processors – Vector Processors – Array Processors – SIMD processors – Systolic architecture - Dataflow.	10	-	2
2	Enabling Technologies: System Development Trends – Principles of Processor Design – Microprocessor Architecture Families – Hierarchical Memory Technology – Cache Coherence Protocols – Shared Memory Consistency – Distributed Cache Memory Architecture – Latency Tolerance Techniques – Multithreaded Latency Hiding.	15	-	2
3	System Interconnects: Basics of Interconnection Networks – Network Topologies and Properties – Buses, Crossbar and Multistage Switches, Software Multithreading – Synchronization Mechanisms.	13	-	2
4	Parallel Programming: Paradigms and Programmability – Parallel Programming Models – Shared Memory Programming.	15	-	2
5	Message Passing: Message Passing Paradigm – Message Passing Interface – Parallel Virtual Machine.	12	-	2
Total		65	-	10

TEXT BOOK

1. Kai Hwang, Zhi.Wei Xu, *Scalable Parallel Computing*, Tata McGraw Hill, New Delhi, 2003.

REFERENCE BOOKS

- 1. David E. Culler, Jaswinder Pal Singh, Anoop Gupta, *Parallel Computing Architecture:* A Hardware Software Approach, Morgan Kaufman Publishers, 1999.
- 2. Michael J. Quinn, *Parallel Programming in C with MPI & OpenMP*, Tata McGraw-Hill, 2003.
- 3. Kai Hwang, Advanced Computer Architecture, Tata McGraw-Hill, New Delhi, 2003.

Stream 4: 3ITE1ST – Foundations of Software Testing and Quality Assurance

OBJECTIVES:

- 1. To learn the concepts of Software Quality Assurance.
- 2. To understand the basic concepts of testing, test design techniques and testing tools.
- 3. To get prepared for ISTQB Certified Tester Foundation Level (CTFL) examination.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand the fundamental Quality standards in SQA.
- 2. Understand the Metrics in a software process.
- 3. Describe the principles, processes, static techniques of testing.
- 4. Differentiate among the various test design techniques.
- 5. Understand how to do Test Management.
- 6. Understand the types and use of testing tools.

Unit	Course Content	L	Р	Т
1	Software Quality Assurance: Quality concepts – Software Quality Assurance issues and activities – Software reviews – Formal technical review – Formal approaches to SQA – Statistical SQA – Software reliability – SQA plan - ISO 9000 quality standards – CMMI quality standards.	10	-	-
2	Metrics: Metrics in the process and project domains – Software measurement – Metrics for software quality – Integrating metrics within the software process – Metrics for small organizations – Establishing a software metric program.	10	-	-
3	 Fundamentals of Testing: Why testing is necessary – What is testing – Testing principles – Fundamental test process – The psychology of testing. Testing throughout the software life cycle: Software development models – Test levels – Test types : the targets of testing – Maintenance testing. Static Techniques: Reviews and the test process – Review process – Static analysis by tools. 	16	_	_
4	Test Design Techniques: Identifying test conditions and designing test cases – Categories of test design techniques – Specification-based or white-box techniques – Experience-based techniques – Choosing a test technique.	12	-	9
5	Test Management: Test organization – Test plans, estimates and strategies – Test progress monitoring and control – Configuration management – Risk and testing – Incident management. Tool Support for Testing: Types of test tools – Effective use of tools: Potential benefits and risks – Introducing a tool into an organization.	12	-	6
Total	ž ž	60	-	15

TEXT BOOKS

- 1. Roger Pressman, Software Engineering A Practitioner's Approach,6th Ed,TMH, 2010.
- 2. Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Rex Black, *Foundations of Software Testing*, Cengage Learning EMEA, 2008.

REFERENCE BOOKS

1. Renu Rajani, Pradeep Oak, Software Testing – Effective Methods, Tools and Techniques, TMH, 2011.

2. Cem Kaner, Jack Falk, Hung Quoc Nguyen, *Testing Computer Software*, 2nd Ed, Wiley India, 2012.

WEBSITES

- 1. istqbexamcertification.com
- 2. www.istqb.in
- 3. www.istqb.org

Elective II

Stream 1: 4ITE2SC – Satellite Communication

OBJECTIVES:

- 1. To learn the concept of satellite orbits and launching.
- 2. To learn the basics of the communication systems involved.
- 3. To learn the various applications of satellites.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand orbital mechanics and launch methodologies.
- 2. Describe satellite subsystems.
- 3. Explain the communication systems involved with satellites.
- 4. Explain the various applications of satellites.

Unit	Course Content	L	Р	Т
1	Orbit Dynamics: Kepler's Laws - Newton's Laws - Orbit Parameters - Orbital perturbation - Station keeping - Geostationary and non- Geostationary orbits - Frequency allocation - frequency co-ordination and regulatory services - Sun transit outages - Limits of visibility - Launching vehicles and propulsion.	13	-	2
2	Space Segment: Spacecraft configuration - Communication payload and supporting sub systems - Satellite uplink – down link - Link power budget - C/No - G/T - Noise temperature - System noise - Propagation factors - Rain and Ice effects - Polarization.	14	-	2
3	Satellite Access: Modulation and Muliplexing: Voice, Data, Video, Analog – Digital transmission system - Digital Video Broadcast - Multiple Access: FDMA, TDMA, CDMA - Assignment Methods - Spread spectrum communication - Compression – Encryption.	14	I	2
4	Earth Segment: Transmitter – Receivers – Antennas - Terrestrial interface – TVRO – MATV – CATV - Test equipments - Measurements on G/T - c/No. – EIRP - Antenna Gain.	14	-	2
5	Satellite Applications: INTELSAT series – INSAT – VSAT – Facsimile system - Weather Service - Remote sensing - Mobile Satellite Service: GSM, GPSM, INMARSAT, SARSAT, LEO, MEO - Satellite navigation System - Direct Broadcast Satellites (DBS) - Direct to Home broadcast (DTH) - Digital Audio Broadcast (DAB) - Business TV(BTV) – GRAMSAT - Specialized services – E-mail, Video Conferencing, Internet.	10	-	2
Total		65	-	10

TEXT BOOKS

- 1. Dennis Roddy, *Satellite Communication*, Regents / Prentice Hall, Englewood Cliffs, New Jersey, 1989.
- 2. Wilbur L. Pritchard, Hendir G. Suyderhoud, Rober A. Nelson, *Satellite Communication Systems Engineering*, Prentice Hall, 2nd Edition, 1993.

REFERENCE BOOKS

- 1. N. Agarwal, Design of Geosynchronous Space Craft, Prentice Hall, 1986.
- 2. Bruce R. Elbert, *The Satellite Communication Application Hand Book*, Artech House Bostn, London, 1997.
- 3. Tri T. Ha, Digital Satellite Communication, 2nd Edition, Tata McGraw Hill, 1990.

- 4. Emanuel Fthenakis, Manual of Satellite Communication, McGraw Hill, 1984.
- 5. Robert G. Winch, Telecommunication Transmission Systems, McGraw Hill, 1993.
- 6. Brian Ackroyd, *World Satellite Communication and Earth Station Design*, BSP Professional Books, 1990.
- 7. G. B. Bleazard, Introducing Satellite Communications, NCC Publications, 1985.

Stream 2: 4ITE2BS - Biometric Systems

OBJECTIVES:

- 1. To learn the basic concepts of Biometric systems.
- 2. To understand the representation, techniques and applications of fingerprint identification, Iris & face recognition and voice scan.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand the fundamental concepts of biometric systems.
- 2. Understand the technologies and applications of fingerprint identification.
- 3. Understand the basic concepts of Iris recognition, its representation, strengths and weaknesses.
- 4. Describe the basic concepts of face recognition, its representation, strengths and weaknesses.
- 5. Explain the technologies and methods for face detection.
- 6. Understand the basic concepts, approaches, strengths and weaknesses of voice scan.

Unit	Course Content	L	P	Τ
1	Biometric Fundamentals: Key Biometric terms and Processes – Definitions - Verification and identification – Matching - Accuracy in Biometric Systems – False match rate - False nonmatch rate - Failure to enroll rate – Derived metrics - An Introduction to Biometric Authentication Systems- a taxonomy of application environment, a system model, biometrics and privacy.	13	I	2
2	Fingerprint Identification Technology: History, Components, Application of Fingerprints, The Technology- Finger Scan Strengths and Weaknesses, Criminal Applications, Civil Applications, Commercial Applications, Technology Evaluation of Fingerprint Verification Algorithms.	13	-	2
3	Iris Recognition: Introduction, Anatomical and Physiological underpinnings, Components, Sensing, Iris Scan Representation and Matching, Iris Scan Strengths and Weaknesses, System Performance, Future Directions.	13	I	2
4	Face Recognition: Introduction, components, Facial Scan Technologies, Face Detection, Face Recognition- Representation and Classification, Kernel- based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition.	13	I	2
5	Voice Scan: Introduction, Components, Features and Models, Addition Method for managing Variability, Measuring Performance, Alternative Approaches, Voice Scan Strengths and Weaknesses, NIST Speaker Recognition Evaluation Program, Biometric System Integration.	13	-	2
Total		65	-	10

TEXT BOOKS

- 1. James Wayman & Anil Jain, *Biometric Systems Technology, Design and Performance Evaluation*, Springer-verlag London Ltd, USA, 2005.
- 2. Sanir Nanavati, Michael Thieme, Biometrics Identity Verification in a Networked World,

Wiley Computer Publishing Ltd, New Delhi, 2003.

REFERENCE BOOK

1. John D. Woodword Jr., Biometrics, Dreamtech Press, New Delhi, 2003.

Stream 3: 4ITE2GC – Grid Computing

OBJECTIVES:

- 1. To understand the basic concepts of grid computing.
- 2. To learn grid computing architecture, core components and services.

OUTCOMES:

- 1. Explain the fundamental concepts of grid and utility computing, the classification of grid computing organizations and their roles.
- 2. Describe the problems of coordinated resource sharing, virtual organization formation, and a protocol architecture solution for Grid problems.
- 3. Explain the current and prominent technology initiatives that are affecting the recent Grid Computing revolution.
- 4. Explain merging Grid Services Architecture with the Web Services Architecture.
- 5. Explain the concept of Open Grid Service Architecture, GLOBUS GT3 Toolkit Architecture, its core components and services.

Unit	Course Content	L	Р	Т
	Introduction: Early Grid Activities - Current Grid Activities - An Overview of Grid Business Areas - Grid Applications - Grid			
	Infrastructure.			
	Grid Computing Organizations and their Roles: Organizations			
1	Developing Grid Standards and Best Practice Guidelines -	10	-	2
	Organizations Developing Grid Computing Toolkits and the			
	Framework - Organizations Building and using Grid-Based Solutions			
	to Solve Computing - Data and Network Requirements - Commercial			
-	Organizations Building and using Grid-Based Solutions.			
	Autonomic Computing Rusings on Demand and Infrastructure			
2	Virtualization - Service-Oriented Architecture and Grid - Semantic	12	-	2
	Grids			
	Architectures: Service-Oriented Architecture - Web Services			
	Architecture – XML, Related Technologies and their Relevance to Web			
	Services - XML Messages and Enveloping - Service Message			
	Description Mechanisms - Relationship between Web Service and Grid			
3	Service - Web Service Interoperability and the Role of the WS-I	15	-	2
	Organization.			
	OGSA Overview: OGSA Architecture and Goal, Commercial Data			
	Center (CDC), National Fusion Collaborator (NFS), Online Media and			
	Entertainment	 		
	OGSA Platform Components: Native Platform Services and			
4	Networking Services Transport and Security OGSA Infrastructure			
	OGSA Basic Services			
	Open Grid Services Infrastructure (OGSI): Grid Services - A High-	15	-	2
	Level Introduction to OGSI - Technical Details of OGSI Specification -			
	Introduction to Service Data Concepts - Grid Service: Naming and			
	Change Management Recommendations.			

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Unit	Course Content	L	Р	Т
	OGSA Basic Services: Common Management Model (CMM) -			
	Service Domains - Policy Architecture - Security Architecture -			
5	Metering and Accounting - Common Distributed Logging - Distributed	13	-	2
	Data Access and Replication.			
	GLOBUS GT3 Toolkit: Architecture.			
Total		65	-	10

TEXT BOOK

1. Joshy Joseph, Craig Fellenstein, Grid Computing, Pearson Education, Delhi, 2007.

REFERENCE BOOK

1. Ahmar Abbas, *Grid Computing: A Practical Guide to Technology and Applications*, Firewall Media, 2008.

Stream 4: 4ITE2ST – Software Testing

OBJECTIVES:

- 1. To learn test process models and risk management in testing.
- 2. To learn different test techniques, review methods and tools for test automation.
- 3. To get prepared for ISTQB Advanced Certification for Advanced Test Analyst.

OUTCOMES:

- 1. Compare and contrast different Test Process Models.
- 2. Analyze Risks and apply Risk Mitigation Processes.
- 3. Explain different specification-based and structure-based testing techniques.
- 4. Understand the basic concepts of static and dynamic analysis methods.
- 5. Describe the quality attributes for domain and technical testing.
- 6. Explain the various types of test reviews.
- 7. Understand methods and tools for test automation.

Unit	Course Content	L	P	Т
1	Test Basics: Testing in the Software Lifecycle – Specific systems – Metrics and measurement – Ethics. Testing Processes: Test Process Models – Test planning and control – Test analysis and design: Functional test objectives, Test oracles, Standards, Static tests, Metrics – Test implementation and execution: Test procedure and readiness, Test environment readiness, Blended test strategies, Starting test execution, Running a single test procedure, Logging test results, Use of amateur testers, Standards, Metrics – Evaluating exit criteria and reporting: Test suite summary, Defect breakdown, Confirmation test failure rate, System test exit review, Standards – Evaluating exit criteria and reporting exercise - Test closure activities.	10	-	2
2	Test Ivianagement: Test management documentation – Test plan documentation templates – Test estimation – Scheduling and test planning – Test progress monitoring and control – Business value of testing – Distributed, outsourced and insourced testing – Risk-based testing: Risk management, Risk identification, Risk analysis or risk assessment, Risk mitigation or risk control, An example of risk identification and assessment results, Risk-based testing throughout the lifecycle, Risk-aware testing standards – Risk-based testing exercises - Failure mode and effects analysis: Test management issues. Test Techniques, Specification-based techniques, Equivalence Partitioning: Avoiding equivalence partitioning errors - Composing test cases with equivalence partitioning - equivalence partitioning exercise. Boundary Value Analysis: Examples of equivalence partitioning and boundary values - Number of boundary values - Boundary value exercise.	10	-	2
3	 Specification-based techniques (contd): Decision Tables: Collapsing columns in the table - Cause-effect graphs Combining decision table testing with other techniques - Nonexclusive rules in decision tables - Decision table exercise. Use Cases: Use cases - Use case exercise. State-based Testing: State-based testing and state transition diagrams - 	11	-	8

Unit	Course Content	L	Р	Т
	Superstates and substates - State transition tables - Switch coverage -			
	State testing with other techniques - State testing exercise.			
	Pairwise testing: Pairwise testing - Pairwise testing exercise.			
	Classification trees: Classification trees exercise			
	Deriving tests from the test basis: Deriving tests from the test basis			
	exercise.			
	Structure-based techniques: Defect-based and Experience-based			
	techniques – Defect taxonomies – Error guessing – Checklist testing –			
	Exploratory testing – Test charters – Software attacks – An example of			
	effective attacks – Other attacks – Common themes – Exercises.			
	Static analysis: Introduction.			
	Dynamic analysis: Introduction.			
4	1 ests of Software Characteristics:	13	-	2
	Quality Auribules for Domain Testing: Functional accuracy –			
	runctional suitability – Functional interoperability – Functional			
	Interoperability exercise – Functional security – Accessionity –			
	Osability – Usability exercise.			
	Security attacks Paliability Efficiency testing Maintainability			
	testing – Portability testing			
	Reviews.			
	Principles of reviews – Types of reviews – Introducing reviews –			
	Success factor for reviews: Wiegers's review checklist Deutsch's			
	review checklist - Wiegers's checklist review exercise - Deutsch's			
	checklist review exercise.			
	Incident Management: When can a defect be detected? – Defect			
	lifecycle – Defect fields – Metrics and incident management –			
_	Communicating incidents – Incident management exercise.	0		0
5	Test Tools and Automation:	9	-	8
	Test Tool Concepts: Test automation costs - Test automation risks -			
	Test automation benefits - Test automation strategies - test tool			
	integration and scripting – Test tool classification.			
	Test Tool Categories: Test management tools – Test execution tools –			
	Debugging, troubleshooting, fault seeding, injection tools - Static and			
	dynamic analysis tools - Performance test tools - Web testing tools -			
	Simulators and emulators.			
Total		53	-	22

TEXT BOOK

1. Rex Black, Advanced Software Testing - Volume 1, Rocky Nook Inc., 2009.

REFERENCE BOOK

1. Dorothy Graham, Erik Van Veenendaal, Isabel Evans, Rex Black, *Foundations of Software Testing*, Cengage Learning EMEA, 2008.

WEBSITES

- 1. istqbexamcertification.com
- 2. www.istqb.in
- 3. www.istqb.org

Soft Skills

SAR1: Analytical Reasoning I

OBJECTIVES:

1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
- 2. Solve verbal reasoning problems of the given types.
- 3. Improve the speed of calculations while solving such problems.

Unit	Course Content	L	Р	Т
1	Objective Arithmetic: Number – H.C.F. & L.C.M. of Numbers –	C		4
1	Decimal Fractions – Simplification.	2	-	4
2	Objective Arithmetic: Average – Percentage – Profit & Loss – Simple	2		4
2	Interest.	2	-	4
3	Objective Arithmetic: Calendar – Clocks – Heights and Distances.	2	-	4
4	Verbal Reasoning: Series – Analogy – Classification - Coding &	C		4
4	Decoding – Number, Ranking and Time Sequence Test.	4	-	4
5	Verbal Reasoning: Logical Sequence of Words – Situation Reaction	2		4
5	Test – Verification of Truth of the Statement.	2	-	4
Total		10	-	20

Number of Credits: 2

- 1. Dr. R. S. Aggarwal, *A Modern Approach to Verbal Reasoning (Fully Solved)*, Revised Edition, S. Chand and Company Ltd., Reprint 2010.
- 2. Dr. R. S. Aggarwal, *Objective Arithmetic*, S. Chand and Company Ltd., Reprint 2010.

SAR2: Analytical Reasoning II

OBJECTIVES:

1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
- 2. Solve verbal reasoning problems of the given types.
- 3. Improve the speed of calculations while solving such problems.

Unit	Course Content	L	Р	Т
1	Objective Arithmetic: Square Root and Cube Root – Problems on	2	-	4
	Numbers – Chain Rule.			
2	Objective Arithmetic: Time & Work – Alligation or Mixture –	2	_	Δ
	Compound Interest – Stock & Shares.	2	_	+
3	Objective Arithmetic: Linear Equations in Two Variables – Quadratic	\mathbf{r}		4
	Equations - Arithmetic and Geometric Progressions.	2	-	4
4	Verbal Reasoning: Blood Relations – Puzzle Test – Direction Sense	n		4
	Test.	2	-	4
5	Verbal Reasoning: Data Sufficiency – Eligibility Test – Assertion and	2		4
	Reason.	2	-	4
Total		10	-	20

Number of Credits: 2

- 1. Dr. R. S. Aggarwal, *A Modern Approach to Verbal Reasoning (Fully Solved)*, Revised Edition, S. Chand and Company Ltd., Reprint 2010.
- 2. Dr. R. S. Aggarwal, Objective Arithmetic, S. Chand and Company Ltd., Reprint 2010.

SAR3: Analytical Reasoning III

OBJECTIVES:

1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
- 2. Solve verbal reasoning problems of the given types.
- 3. Improve the speed of calculations while solving such problems.

Unit	Course Content	L	Р	Τ
1	Objective Arithmetic: Problems on Ages – Ratio and Proportion –	C		4
	Partnership.	4	-	4
2	Objective Arithmetic: Pipes and Cisterns – Time and Distance –	ſ		4
	Problems on Trains - Boats and Streams.	2	-	4
3	Objective Arithmetic: Area – Volume and Surface Areas –	ſ		4
	Trigonometry.	4	-	4
4	Verbal Reasoning: Logic – Statement: Arguments - Statement:	ſ		4
	Assumptions - Statement: Courses of Action.	Z	-	4
5	Verbal Reasoning: Statement: Conclusions – Deriving Conclusions	2		4
	from Passages – Theme Detection – Cause and Effect Reasoning.	2 -	-	4
Total		10	-	20

Number of Credits: 2

- 1. Dr. R. S. Aggarwal, *A Modern Approach to Verbal Reasoning (Fully Solved)*, Revised Edition, S. Chand and Company Ltd., Reprint 2010.
- 2. Dr. R. S. Aggarwal, Objective Arithmetic, S. Chand and Company Ltd., Reprint 2010.

OQCC: Quality Control Circles (Theory)

OBJECTIVES:

1. To develop the skill to solve problems using a systematic approach, both as an individual and in a team.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Understand the importance, functions and structure of quality control circles.
- 2. Identify problems and formulate them in a formal, structured manner.
- 3. Understand and use the various problem solving tools.
- 4. Understand and implement the process of PDCA to solve problems.
- 5. Gain an understanding of leadership and motivation.

Unit	Course Content	L	P	Τ
1	Introduction: Introduction to Quality Circles - Objectives of Quality	ر د		4
	Circles - Benefits of Quality Circles.	2	-	4
2	Structure: Structure of Quality Circles - Quality Circle Meetings -	\mathbf{r}	-	4
	Roles of facilitators, coordinators and leader.	Ζ		
3	Problem Identification: Brainstorming - Problem identification.	2	-	4
4	Data Collection: Tools – PDCA.	2	-	4
5	Problem Solving: Problem solving and presentation - Leadership and	2	-	4
	Motivation.			
Total		10	-	20

SUGGESTED READING

- 1. Reference materials from QCFI, Chennai Chapter.
- 2. Reference materials from Port Trust of Madras.

OQCCP: Quality Control Circles (Presentation)

OBJECTIVES:

- 1. To work as a part of a Quality Control Circle.
- 2. To identify and solve problems.
- 3. To develop team spirit and leadership qualities.
- 4. To acquire presentation skills.

OUTCOMES:

Upon completion of the course, the student will be able to

- 1. Function as a part of a Quality Control Circle.
- 2. Identify and solve problems in a team as part of QCC.
- 3. Understand the importance of team work and leadership in a QCC.
- 4. Learn to make presentations of solved problems to an audience, effectively and within a stipulated time.

Every student would be member of a Quality Circle and will be evaluated for a project presentation.

Total Number of Credits (OQCC & OQCCP): 2