M.TECH. (FULL TIME)
COMPUTER SCIENCE AND ENGINEERING
CURRICULUM & SYLLABUS

2018-19

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

FACULTY OF ENGINEERING AND TECHNOLOGY
SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
SRM NAGAR, KATTANKULATHUR – 603 203

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
M.Tech-COMPUTER SCIENCE AND ENGINEERING CURRICULUM
2018-19

COURSE CODE	COURSE NAME	L	T	P	C
SEMESTER I					
CS2001	Data Structures and Algorithms	3	0	2	4
CS2002	Parallel Computer Architecture	4	0	0	4
CS2003	Object Oriented Software Engineering	4	0	0	4
CAC2001	Career Advancement Course For Engineers - I	1	0	1	1
	Program Elective- I	3	0	0	3
	Program Elective- II	3	0	0	3
TOTAL		16	0	3	19
Total Contact Hours: 19					
SEMESTER II					
CS2004	Data Base Technology	4	0	0	4
CS2005	Computer Networks and Management	4	0	0	4
CS2006	System Programming	3	0	2	4
CAC2002	Career Advancement Course For Engineers - II	1	0	1	1
	Program Elective- III	3	0	0	3
	Program Elective- IV	3	0	0	3
TOTAL		18	0	3	19
Total Contact Hours: 21					
SEMESTER III					
	Program Elective- V	3	0	0	3
	Program Elective- VI	3	0	0	3
CAC2003	Career Advancement Course For Engineers - III	1	0	1	1
CS2047	Seminar	0	0	1	1
CS2049	**Project Phase I**	0	0	12	6
TOTAL		7	0	14	14
Total Contact Hours: 21					
SEMESTER IV					
CS2050	**Project Phase II**	0	0	32	**16**
Semester I-III					
	Supportive course (1 course of 3 credits in I or II or III sem.)	3	0	0	3

	Interdisciplinary Elective (1course of 3 credits in I or II or III sem.)	3	0	0	3
CAC2001	Career Advancement Course For Engineers - I	1	0	1	1
CAC2002	Career Advancement Course For Engineers - II	1	0	1	1
CAC2003	Career Advancement Course For Engineers - III	1	0	1	1
	TOTAL	**9**	**0**	**3**	**9**
	Total Contact Hours: 12				
	TOTAL CREDITS	**74**			

Total credits to be earned for the award of M.Tech degree – 74 credits

PROGRAM ELECTIVES

Course Code	Name of the course	L	T	P	C
CS2101	Component Based System Design	3	0	0	3
CS2102	Bio Inspired Computing	3	0	0	3
CS2103	Distributed Operating Systems	3	0	0	3
CS2104	Digital Image Processing	3	0	0	3
CS2105	Human Computer Interaction	3	0	0	3
CS2106	Wireless Networks	3	0	0	3
CS2107	TCP / IP Technology	3	0	0	3
CS2108	Pattern Recognition Techniques	3	0	0	3
CS2109	Data Warehousing and its Applications	3	0	0	3
CS2110	Network Security & Cryptography	3	0	0	3
CS2111	Grid Computing	3	0	0	3
CS2112	Natural Language Understanding	3	0	0	3
CS2113	Data Mining Concepts and Techniques	3	0	0	3
CS2114	Wireless Sensor Networks and Programming	3	0	0	3
CS2115	Server Oriented Architecture	3	0	0	3
CS2116	Cloud Computing	3	0	0	3
CS2117	Trusted Computing	3	0	0	3

SUPPORTIVE COURSES

Course Code	Name of the course	L	T	P	C
MA2013	Mathematical Foundations of Computer Science	3	0	0	3
MA2010	Graph Theory and Optimization Techniques	3	0	0	3
MA2011	Stochastic Processes and Queueing Theory	3	0	0	3

NOTE:

Students have to register for the courses as per the following guidelines:

Sl. No.	Category	Credits				Category total
		I Semester	II Semester	III Semester	IV Semester	
1	Core courses	12 (3 courses)	12 (3 courses)	---	---	24
2	Program Elective courses	18 (in I to III semesters)			---	18
	Interdisciplinary elective courses (any one program elective from other programs)	3 (One course to be taken in Semester I or II or III)				3
3	Supportive courses - mandatory	3 (One course to be taken in Semester I or II or III)			---	3
4	Seminar	---	---	1	---	1
6	Project work	---	---	06	16	22
	Total					71

Legend:

L - Number of lecture hours per week
T - Number of tutorial hours per week
P - Number of practical hours per week
C - Number of credits for the course

CS2001	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
	Total Contact Hours - 75	3	0	2	4
	Prerequisite				
	Nil				

PURPOSE

The purpose of this course is to impart knowledge on various linear and nonlinear data structures, study their implementations and analyze their efficiency.

INSTRUCTIONAL OBJECTIVES

1.	To learn about analyzing and designing algorithms to solve a problem and learn to find the asymptotic efficiency of an algorithm
2.	To be familiar with various data structure concepts like Stacks, Queues, Linked List and Hashing
3.	To learn implementations of advanced Data structures and sorting algorithms
4.	To learn advanced data structures such as balanced search trees, hash tables and priority queues
5.	To study various graph processing algorithms and Algorithm Design techniques

UNIT I – INTRODUCTION   (10 hours)

The Role of Algorithms in computing – Analyzing Algorithms – Designing Algorithms – Growth of functions – Asymptotic Notations – Divide and Conquer – Recurrences – Maximum subarray problem –Stressan's Method – Substitution method – Recurrence tree method –The Master method – Floors and Ceilings.

UNIT II – LISTS, STACKS, QUEUES AND HASHING   (17 hours)

Abstract Data Types (ADTs) –The List ADT–The Stack ADT– The Queue ADT – Hashing: Hash Function – Separate Chaining – Open Addressing – Rehashing – Extendible hashing.

Implementation in C or C++: Operations (Create, Access, Insert and Delete) - Singly–linked List - Doubly–linked List - Circular–linked List - Operations on a Hash Table – Create, Insert, Find and Retrieve

UNIT III –TREES AND SORTING   (20 hours)

Implementation of Trees – Tree Traversals with an application – Binary Trees – Binary Search Trees –AVL trees – Splay Trees–B Trees–Sorting: Insertion Sort–Shell Sort–Heap Sort–Merge Sort–Quick Sort - Implementation in C or C++: Tree Traversals – Inorder, Preorder and Postorder - Operations on Binary Search trees – Insert, Find, Delete and Traversals - Soring Techniques – Insertion Sort, Merge Sort and Quick Sort.

UNIT IV – GRAPH ALGORITHMS   (17 hours)

Representations of Graphs – Topological sort – Shortest – Path Algorithms – Network Flow Problems –Minimum Spanning Tree – Applications of Depth – First–Search – NP – Completeness Implementation in C or C++: Graph Traversals - Breadth First Search - Depth First Search - Graph Processing Algorithms - Dijkstra's Algorithm for minimum cost path - Kruskal's Algorithm for minimum spanning trees.

UNIT V – ALGORITHM DESIGN TECHNIQUES   (11 hours)

Greedy Algorithms – Divide and Conquer – Dynamic Programming – Randomized algorithms –Backtracking Algorithms. Implementation in C or C++: Divide and Conquer – Knapsack Problem - Backtracking – 8-Queen's Problem.

REFERENCES

1. Mark Allen Weiss, "*Data Structures and Algorithm Analysis in C*", 2nd Edition, Pearson Education, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, "*Introduction toAlgorithms*", PHI Learning Pvt. Ltd., 2010.
3. Gilles Brassard, Paul Bratley, "*Fundamentals of Algorithms*", PHI Learning Pvt. Ltd, 2011.
4. Aaron M. Tanenbaum, YedidyahLangsam, Moshe J.Augenstein, "*Datastructures using C*", Pearson Education, 2011.
5. Richard F. Gillberg, Behrouz A. Forouzan, "*Data structures: A PseudocodeAppproach with C*", Cengage Learning, Second Edition, 2009.
6. Kenneth A. Berman, Jerome L. Paul, "*Algorithms*", Cengage Learning, 2008.
7. http://ocw.mit.edu/courses/electrical–engineering–and–computer – science/6–046j–introduction–to–algorithms.
8. http://ocw.mit.edu/courses/electrical–engineering–and–computer–science / 6–851–advanced–data–structures

CS2002	**PARALLEL COMPUTER ARCHITECTURE**	L	T	P	C
	Total Contact Hours - 60	**4**	**0**	**0**	**4**

0

	Prerequisite				
	Nil				

PURPOSE

To learn the advanced concepts of Computer Architecture

INSTRUCTIONAL OBJECTIVES

1.	To learn the parallel models and processors
2.	Pipelining and scalable architectures
3.	Memory organization
4.	To learn the multithreaded and data flow architecture

UNIT I - INTRODUCTION TO PARALLEL PROCESSING   (12 hours)

Basic concepts – types and level of parallelism - classification of parallel architecture – basic parallel techniques - shared memory multiprocessors – distributed memory multicomputer – parallel Random access machine – VLSI complexity model .

UNIT II - PROCESSORS AND MEMORY HIERARCHY   (12 hours)

Advanced processor technology – Super scalar and vector processors – Memory hierarchy technology, virtual memory technology – cache memory organization – shared – memory organization.

UNIT III – PIPELINING AND SUPERSCALAR TECHNIQUES   (12 hours)

Linear pipeline processors – Nonlinear pipeline processors – Instruction pipeline design –Arithmetic pipeline design – Superscalar pipeline design

UNIT IV – PARALLEL AND SCALABLE ARCHITECTURE   (12hours)

Cache coherence and synchronization mechanisms – coherence problem – snoopy bus and directory based protocol - Vector processing principle Vector instruction types – vector access memory schemes - SIMD computer organization - Implementation models - CM2 – architecture latency hiding techniques

UNIT V – MULTITHREADED & DATA FLOW ARCHITECTURE   (12 hours)

Principles of Multithreading – issues and solutions – multiple context processors - Scalable and Multithreaded architectures- Stanford Dash multiprocessor - KSR1 - Dataflow computer-static data flow computer -Dynamic data flow computer

REFERENCES

1. Kai Hwang, "*Advanced Computer Architecture", Parallelism, Scalability,Programmability*", McGraw Hill, 1993.
2. Hwang Briggs, "*Computer Architecture and parallel processing*", McGraw Hill, 1984.
3. Dezsosima, Terence Fountain ,Peter Karsuk , " *Advanced Computer Architectures : A design space approach*" , Addison Wesley, 1997.

	OBJECT ORIENTED SOFTWARE ENGINEERING	L	T	P	C
CS2003	Total Contact Hours - 60	4	0	0	4
	Prerequisite				
	Nil				

PURPOSE
To learn the advanced software engineering principles and methodologies for effective Software tools and development

INSTRUCTIONAL OBJECTIVES	
1.	To learn about software prototyping, analysis and design
2.	To learn UML and its usage
3.	To estimate and scheduling of objects
4.	To implement and test an object.

UNIT I - INTRODUCTION   (10 hours)

Software Engineering Paradigms - Software Development process models - Project & Process - Project management – Process & Project metrics - Object Oriented concepts & Principles.

UNIT II - PLANNING & SCHEDULING   (12 hours)

Software prototyping - Software project planning – Scope – Resources - Software Estimation - Empirical Estimation Models-Planning-Risk Management - Software Project Scheduling – Object Oriented Estimation & Scheduling.

UNIT III - ANALYSIS & DESIGN **(14 hours)**

Analysis Modeling - Data Modeling - Functional Modeling & Information FlowBehavioral Modeling-Structured Analysis - Object Oriented Analysis - Domain Analysis-Object Oriented Analysis process   - Object Relationship Model - Object Behaviour Model. Design Concepts & Principles - Design Process - Design Concepts - Modular Design – Design Effective Modularity - Introduction to Software Architecture - Data Design – Transform Mapping – Transaction Mapping – OOD - Design System design process- Object design process - Design Patterns.

UNIT IV- IMPLEMENTATION & TESTING **(12 hours)**

Top-Down , Bottom-Up , object oriented product Implementation & Integration. Software Testing methods-White Box, Basis Path-Control Structure –Black Box-Unit Testing- Integration testing Validation & System testing. Testing OOA & OOD models-Object oriented testing strategies.

UNIT V- MAINTENANCE **(12 hours)**

Maintenance   process-System   documentation-program   evolution   dynamics-Maintenance costs Maintainability measurement – Case Studies

REFERENCES

1. Roger S. Pressman, "*Software Engineering A Practitioner's Approach*" , Sixth Edition, Tata McGraw Hill 2010.
2. Grady Booch, Robert A.Maksimchuk Michael W. Engle, Bobby J.Young Jim Connallen Kelli A. Houston , "*Object oriented analysis and design withapplication*" , Addison Wesley, 3rdedition, , 2010.
3. Pankaj Jalote "*An Integrated Approach to Software Engineering*" Narosa Publishing House 2005.
4. Carlo Ghezzi Mehdi Jazayer, Dino Mandrioli, "*Fundamentals of SoftwareEngineering*", Prentice Hall of India 2002.

	ELECTIVE - I	**L**	**T**	**P**	**C**
	Total Contact Hours - 45	**3**	**0**	**0**	**3**

Students to choose one Ejlective course from the list of courses mentioned in the curriculum

	ELECTIVE - II	L	T	P	C
	Total Contact Hours - 45	3	0	0	3

Students to choose one Elective course from the list of courses mentioned in the curriculum

	SUPPORTIVE COURSE	L	T	P	C
	Total Contact Hours - 45	3	0	0	3

Students to choose one course from the list of supportive courses mentioned in the curriculum either in I, II or III semester

		L	T	P	C
	INTERDISCIPLINARY ELECTIVE	3	0	0	3
	Total Contact Hours - 45				

Students to choose one Elective course from the list of Post Graduate courses specified under the Faculty of Engineering and Technology other than courses under M.Tech (CSE) curriculum either in I, II or III semester

CS2004	DATABASE TECHNOLOGY	L	T	P	C
	Total Contact Hours - 60	4	0	0	4
	Prerequisite				
	Nil				

PURPOSE

This course provides the fundamental concepts of data base systems

INSTRUCTIONAL OBJECTIVES

1.	To provide a general introduction to relational model
2.	To learn about ER diagrams
3.	To learn about Query processing and Transaction Processing

UNIT I – INTRODUCTION AND CONCEPTUAL MODELING   (12 hours)

Database and database users – Database system concepts and architecture – data modeling using Entity-Relationship model – Enhanced Entity-Relationship model.

UNIT II – THE RELATIONAL DATA MODEL   (12 hours)

Relational model: Concepts, Constraints, Languages, Design and Programming – Relational data model and relational database constraints – relational algebra-relational database design by ER and EER-to-relational mapping – SQL – schema definition, constraints, Queries and Views.

UNIT III – NORMALIZATION, DATA STORAGE, INDEXING AND QUERY PROCESSING (12 hours)

Functional dependencies and normalization of relational databases – relational database design algorithms and further dependencies . Disk storage, Indexing, Query processing and physical design – disk storage, basic file structures and hashing – indexing structures for files – algorithms for query processing and optimization.

UNIT IV – TRANSACTION PROCESSING AND OBJECT RELATIONAL DATABASES (12 hours)

Transaction processing concepts – Introduction – concurrency control and database recovery techniques. Concepts for Object databases – Object database standards, languages and design, object relational and extended-relational systems.

UNIT V – ADVANCED MODELING   (12 hours)

Database security - Enhanced data models for advanced applications – distributed databases and client-server architecture – web database programming using PHP – XML – extensible markup language.

REFERENCES

1. RamezElmasri and ShamkantB.Navathe, *"Fundamentals of DatabaseSystems"*, Fifth Edition, Pearson, 2008.
2. Silberschatz, H. Korth and S. Sudarshan, *"Database System Concepts"*, 6th Edition, McGraw-Hill International, 2011.
3. Hector Garcia-Molina, Jeffrey D.Ullman, Jennifer Widom, *"Database System TheComplete Book"*, 2nd Edition, Pearson 2008.

CS2005	COMPUTER NETWORKS AND MANAGEMENT	L	T	P	C
	Total Contact Hours – 60	4	0	0	4
	Prerequisite				
	Nil				

PURPOSE
This course gives a overview of computer networks, TCP/IP protocols and also covers security and network management aspects

INSTRUCTIONAL OBJECTIVES
1. IPV4 and IPV6 protocols routing
2. Frame relay and ATM congestion control management
3. Network security and Integrated and Differentiated Services
4. Network management and its protocols

UNIT I - HIGH SPEED NETWORKS   **(12hours)**

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel – Wireless LAN's.

UNIT II - CONGESTION AND TRAFFIC MANAGEMENT   **(12hours)**

 Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay- Congestion Control.

UNIT III - TCP AND ATM CONGESTION CONTROL   (12hours)

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO back-off – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT IV - INTEGRATED AND DIFFERENTIATED SERVICES   (12hours)

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services.

UNIT V - PROTOCOLS FOR QOS SUPPORT   (12hours)

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

REFERENCES

1. William Stallings, "*High Speed Networks and Internet*", Pearson Education, Second Edition, 2012.
2. Prakash.C.Guptha, "*Data Communication and Computer Networks*", PHI , 6th printing 2012.
3. Larry L. Peterson and Bruce S Davis , "*Computer Network A System Approach*", Elsevier,5th edition 2010.
4. IrvanPepelnjk, Jim Guichard and Jeff Apcar, "*MPLS and VPN Architecture*", Cisco Press, Volume 1 and 2, 2003.

	SYSTEM PROGRAMMING	L	T	P	C
CS2006	Total Contact Hours - 75	3	0	2	4
	Prerequisite				
	Nil				
PURPOSE					
To learn the design principles of various system software and its techniques					
INSTRUCTIONAL OBJECTIVES					
1.	To learn the various system software like assemblers, loaders, linkers and macro				
2.	To study the features of design phases and parsing techniques of a compiler				
3.	To learn the various techniques of syntax directed translation & code optimization				

UNIT I – INTRODUCTION AND ASSEMBLERS (13 hours) Introduction: Language Processor Fundamentals, Data Structures Language Processing, Search data structures, Data Structures, Scanning, Parsing, Assemblers
– Elements of assembly language programming, Simple assembly scheme, Pass structure of assemblers, Design of a two pass assembler, single pass assembler for IBM PC.

UNIT II – LOADERS AND LINKERS **(15 hours)**

Macro and Linkers: Macro definition and call, Macro expansion, Nested macro calls, Advanced macro facilities, Design of preprocessor, Relocation and linking concepts, Design of a linker, Self relocating program, Linker for MS-DOS, Linking for overlays, Loaders.

UNIT III – GRAMMARS, EXPRESSIONS & AUTOMATA **(16 hours)**

Context free Language - Context free grammar - regular expression - Recognizing of patterns - finite automation (deterministic & non deterministic) Conversion of NDFA to DFA - Conversion of regular expression of NDFA - minimization of NDFA - Derivation - parse tree - ambiguity – handle – Lexical Analysis.

UNIT IV – SYNTAX ANALYSIS **(16 hours)**

Role of parsers - Top down parsing : Left recursion - left factoring - Handle pruning , predictive parsing - recursive descent parsing – Bottom up parsing: Shift reduce parsing - operator precedence parsing - LR parsing – LR (0) items - SLR parsing – Canonical LR parsing -LALR parsing

UNIT V– SYNTAX DIRECTED TRANSLATION & CODE OPTIMIZATION (15 hours)
Intermediate Languages - Quadruple - triple - indirect triples - three-address code- Introduction – Syntax tree- DAG - S-attribute - R-attributes - Assignment statement schemes - Back patching - Syntax free construction - CASE statements - Symbol Table - Symbol table contents - data structure for symbol tables - storage allocation - Runtime storage management. Sources of optimization - Loop optimization - DAG representation of basic block - Dominators - flow graphs - object program - problems in code generation - machine model - simple code generator - Code generation from DAG - peephole optimization.

REFERENCES
1. Dhamdhere D.M., "*Systems Programming*", Tata McGraw Hill Education Pvt. Ltd., 2011.
2. Alfred V Aho , Jeffery D Ullman, Ravi Sethi, "*Compilers, Principles Techniquesand tools* ", Pearson Education ,2011.
3. Srimanta Pal, "*Systems Programming*", Oxford University Press, 2011.

4. Raghavan V., *Principles of Compiler Design*, Tata McGraw Hill Education Pvt. Ltd., 2010.

	ELECTIVE - III	L	T	P	C
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
Students to choose one Elective course from the list of courses mentioned in the curriculum					

	ELECTIVE - IV	L	T	P	C
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
Students to choose one Elective course from the list of courses mentioned in the curriculum					

SEMESTER III

	ELECTIVE – V	L	T	P	C
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
Students to choose one Elective course from the list of courses mentioned in the curriculum					

	ELECTIVE – VI	L	T	P	C
	Total Contact Hours - 45	**3**	**0**	**0**	**3**
Students to choose one Elective course from the list of courses mentioned in the curriculum					

	SEMINAR	L	T	P	C
CS2047		**0**	**0**	**1**	**1**
PURPOSE					
To train the students in preparing and presenting technical topics.					
INSTRUCTIONAL OBJECTIVE					
The student shall be capable of identifying topics of interest related to the program of					

study and prepare and make presentation before an enlightened audience.

The students are expected to give at least two presentations on their topics of interest which will be assessed by a committee constituted for this purpose. This course is mandatory and a student has to pass the course to become eligible for the award of degree. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations

CN2049	PROJECT WORK PHASE I (III SEMESTER)	L	T	P	C
		0	0	12	6
CN2050	PROJECT WORK PHASE II (IV SEMESTER)	0	0	32	16

PURPOSE

To undertake research in an area related to the program of study

INSTRUCTIONAL OBJECTIVE

The student shall be capable of identifying a problem related to the pro gram of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

M.Tech projects should be socially relevant and research oriented ones. Each student is expected to do an individual project. The project work is carried out in two phases – Phase I in III semester and Phase II in IV semester. Phase II of the project work shall be in continuation of Phase I only. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. The method of assessment for both Phase I and Phase II is shown in the following table:

Assessment	Tool	Weightage
In- semester	I review	10%
	II review	15%
	III review	35%
End semester	Final viva voce examination	40%

Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication

in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers / publishers.

CS2101	COMPONENT BASED SYSTEM DESIGN	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course enables us to understand the concept of Component and its representation in languages and packages

INSTRUCTIONAL OBJECTIVES

1.	To learn Fundamentals of Component Based Development
2.	To learn Design of software components and management
3.	To have an overview of the component based technologies like CORBA,COM, EJB technologies and the professions available on the basis of these technologies

UNIT I - BASIC CONCEPTS   (9 hours)

Software Components—Component models and Component Services—Risk Factors and success factors pertaining to component based models—Component Based Software Development.

UNIT II - COMPONENTS, ARCHITECTURE AND PROCESS   (9 hours)

Component Architecture, Component Frameworks-contextual and block box, Component Development –methodology and tools, Component distribution and acquisition , Component assembly , markets and components.

UNIT III - DESIGN OF SOFTWARE COMPONENT   (9 hours)

Software Components and the UML Component Infrastructures—Business Components— Components and Connectors — Designing Models of Modularity & Integration.

UNIT IV - MANAGEMENT OF COMPONENT BASED SOFTWARE SYSTEMS
                                                    (9 hours)

Measurement and Metrics for Software Components—Selecting the right Components—Software Component Project Management—Trouble with Testing Components—Configuration Management and Component Libraries—Evolution and Maintenance of Management of Component based Systems.

UNIT V - COMPONENT TECHNOLOGIES AND PROFESSIONS   (9 hours)

Overview of the Following Component Models: CORBA, COM+, Enterprise Java
Beans, Software Agents. Professions available under component technology

REFERENCES

1. Clemens Szyperski, "*Component Software – Beyond object
   orientedprogramming*", Pearson Education, 2ndedition, 2004.
2. George T. Heinemen, William T. Council, " *Component Based
   SoftwareEngineering*". Addison-Wesley: Upper Saddle River, 2001.
3. Thomas J..Mowbray, William A.Ruh, "*Inside CORBA Distributed
   ObjectStandards and Applications*", Addison – Wesley, 2001.
4. Dale Rojerson, "*Inside COM*", Microsoft Press, 2001.
5. Andreas Vogel, Keith Duddy "*Java Programming with CORBA*" John Wiley &
   Sons.1998.
6. Kuth Short, "*Component Based Development and Object Modeling*", Sterling
   Software, 1997.
7. http://web.cs.wpi.edu/~heineman/html/research_/research.html

CS2102	BIO INSPIRED COMPUTING	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE
To learn how natural and biological systems influence computational field

INSTRUCTIONAL OBJECTIVES	
1.	Be able to explain how biological systems exploit natural processes.
2.	Be able to visualize how complex and functional high-level phenomena can emerge from low-level interactions.
3.	Be able to understand how large numbers of agents can self-organize and adapt.
4.	Be able to design and implement simple bio-inspired algorithms.

UNIT I – INTRODUCTION   **(9 hours)**

What is Life? - Life and Information - The Logical Mechanisms of Life - What is
Computation? Universal Computation and Computability - Computational Beauty of
Nature (fractals, L-systems, Chaos) - Bio-inspired computing - Natural computing -
Biology through the lens of computer science

UNIT II - COMPLEX SYSTEMS & ARTIFICIAL LIFE   **(9 hours)**

Complex Systems and Artificial Life - Complex Networks - Self-Organization and Emergent Complex Behavior - Cellular Automata - Boolean Networks -Development and Morphogenesis - Open-ended evolution

UNIT III - NATURAL COMPUTATION AND NEURAL NETWORKS   (9 hours)
 Biological Neural Networks- Artificial Neural Nets and Learning - pattern classification & linear separability - single and multilayer perceptrons, backpropagation - associative memory - Hebbian learning - Hopfield networks - Stochastic Networks – Unsupervised learning

UNIT IV - EVOLUTIONARY SYSTEMS AND ALGORITHMS   (9 hours)
Evolutionary Programming: biological adaptation & evolution - Autonomous Agents and Self-Organization: termites, ants, nest builiding,flocks, herds, and schools.Geneticalgorithms:Schema theorem - Reproduction-Crossover-Mutation operators

UNIT V - COMPETITION, COOPERATION AND SWARM INTELLIGENCE(9 hours)
Collective Behavior and Swarm Intelligence - Social Insects - Stigmergy and Swarm Intelligence; Competition and Cooperation - zero- and nonzero-sum games - iterated prisoner's dilemma - stable strategies - ecological & spatial models - Communication and Multi-Agent simulation – Immunocomputing

REFERENCES
1. Leandro Nunes De Castro, Fernando Jose Von Zuben, "Recent Developments in Biologically Inspired Computing", Idea Group Publishing, 2005.
2. Leandro Nunes De Castro , "Fundamentals of Natural Computing: Basic concepts, Algorithms and Applications", Chapman & Hall/ CRC Computer & Information Science Series, 2006.
3. Dario Floreano, Claudio Mattiussi, "Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies", MIT Press, 2008.
4. http://informatics.indiana.edu/rocha/i-bic/
5. http://web.eecs.utk.edu/~mclennan/Classes/420/
6. http://www.cs.stir.ac.uk/courses/31YB/

	DISTRIBUTED OPERATING SYSTEMS	L	T	P	C
CS2103	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				

	Nil				

PURPOSE

This course provides an in-depth examination of the principles of distributed systems in general and the functionalities of distributed operating system in particular.

INSTRUCTIONAL OBJECTIVES

1.	To understand the fundamental concepts of distributed system
2.	To understand how communication takes place in Distributed systems
3.	To comprehend the necessity of synchronization, consistency and replication in a Distributed System
4.	To learn the development of distributed applications

UNIT I - FUNDAMENTALS OF DISTRIBUTED SYSTEMS (8 hours)

Distributed Systems – Goals- Hardware and Software concepts – Design issues- Types of distributed systems - System architectures

UNIT II - COMMUNICATION IN DISTRIBUTED SYSTEMS (9 hours)

Communication in Distributed systems: Layered protocols - ATM networks - Client Server model– Message Passing - Remote Procedure Calls.

UNIT III - SYNCHRONIZATION AND PROCESSES (9 hours)

Synchronization: Clock synchronization – Mutual exclusion – Election algorithms, - Atomic Transactions – Deadlocks; Processes - Threads – System models – processor allocation – Scheduling.

UNIT IV - CONSISTENCY, REPLICATION AND FAULT TOLERANCE (9 hours)

Introduction- Data Centric Consistency Models- Client-Centric Consistency Models- Replica Management -Consistency protocols- Introduction to fault Tolerance - Process Resilience -Distributed Commit - Reliable Client Server Communication.

UNIT V - DISTRIBUTED OBJECT BASED SYSTEMS AND DISTRIBUTED FILE SYSTEMS (10 hours)

SYSTEMS (10 hours) Distributed object based systems- Architecture- processes -communication-Synchronization -consistency and replication-Distributed file systems – processes - communication - synchronization and consistency and replication

REFERENCES

1. Andrew S. Tanenbaum, "*Distributed Operating Systems*", Pearson Education, Reprint , 2011.
2. Andrew S. Tannenbaum, Maarten Van Steen, "*Distributed Systems- Principlesand Paradigms*" , Second Edition, PHI, 2007.
3. Pradeep K. Sinha, "*Distributed Operating Systems Concepts and Design*", PHI, 2007.

CS2104	DIGITAL IMAGE PROCESSING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE
The purpose of this course is to impart knowledge on various Digital Image Processing Techniques and their Applications

INSTRUCTIONAL OBJECTIVES	
1.	To learn Image Fundamentals and Processing Techniques
2.	To be familiar with Image Transformations in Spatial Domain and Frequency Domain
3.	To learn various Filters for Image Restoration
4.	To study various Image Compression and Segmentation Techniques

UNIT I – DIGITAL IMAGE FUNDAMENTALS   (8 hours)

Introduction – Origin –Steps in Digital Image Processing – Components; Elements of Visual Perception – Light and Electromagnetic Spectrum – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels.

UNIT II – IMAGE ENHANCEMENT   (9 hours)

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT III – IMAGE RESTORATION   (9 hours)

Noise models – Mean filters – Order Statistics – Adaptive filters – Band reject – Band pass – Notch – Optimum notch filtering – Inverse Filtering – Constrained Least Square Filtering – Wiener filtering.

UNIT IV – IMAGE COMPRESSION   (9 hours)
Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding –Bit – Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding –Wavelet Coding – Compression Standards – JPEG2000.

UNIT V – IMAGE SEGMENTATION AND REPRESENTATION   (10 hours)
Segmentation – Detection of Discontinuities – Edge Linking and Boundary detection – Region based segmentation; Representation – Boundary descriptors – Simple Descriptors – Shape numbers –Regional descriptors – Simple and Topological Descriptors – Introduction to Image Processing Toolbox – Practice of Image Processing Toolbox – Case studies–Various Image Processing Techniques.

REFERENCES
1.   Rafael C. Gonzales, Richard E. Woods, "*Digital Image Processing*", Pearson Education, Third Edition, 2010.
2.   Anil Jain K. "*Fundamentals of Digital Image Processing*", PHI Learning Pvt. Ltd., 2011.
3.   Jayaraman S., Esaki Rajan S., T.Veera Kumar, "*Digital Image Processing*", Tata McGraw Hill Pvt. Ltd., Second Reprint, 2010.
4.   Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "*Digital ImageProcessing Using MATLAB*", Tata McGraw Hill Pvt. Ltd., Third Edition, 2011.
5.   Bhabatosh Chanda, Dwejesh Dutta Majumder, "*Digital Image Processing andanalysis*", PHI Learning Pvt. Ltd., Second Edition, 2011.
6.   Malay K.Pakhira, "*Digital Image Processing and Pattern Recognition*", PHI Learning Pvt. Ltd., First Edition, 2011.
7.   Annadurai S., Shanmugalakshmi R., "*Fundamentals of Digital ImageProcessing*", Pearson Education, First Edition, 2007.
8.   http://eeweb.poly.edu/~onur/lectures/lectures.html
9.   http://www.caen.uiowa.edu/~dip/LECTURE/lecture.html

CS2105	**HUMAN COMPUTER INTERACTION**	L	T	P	C
	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course on Human Computer Interaction provides a basic understanding of Human interfaces, their design principles ,tools as well as interfaces through thought process

INSTRUCTIONAL OBJECTIVES

1.	To learn the design principles of developing a Human Computer Interface
2.	Study of tools and devices required for designing a good interface
3.	Brain computer Interfaces , principles and their tools

UNIT I – INTRODUCTION   (9 hours)

Introduction : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT II – DESIGN PROCESS – SCREEN DESIGN   (9hours)

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions. Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design

UNIT III – WINDOWS AND MULTIMEDIA   (9 hours)

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls; Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT IV– SOFTWARE TOOLS AND DEVICES   (9 hours)

Software tools – Specification methods, interface – Building Tools - Interaction Devices – Keyboard and function keys pointing devices – speech recognition digitization and generation – image and video displays – drivers.

UNIT V– BRAIN COMPUTER INTERFACE   (9 hours)

BCI concepts - Overview of brain organization, neural function, encoding models, and BCI techniques – EEG – waveform and signals from brain – VEP – tools for recording and analyzing – applications areas.

REFERENCES

1. Wilbert O Galitz, "*The essential guide to user interface design*", 3rd Edition, , Wiley , 2007.
2. Ben Shneidermann , Catherine Plaisant, "*Designing the user interface,Strategies for effective Human Computer Interaction*", 3rd Edition, PearsonEducation, 2008.
3. Alan Dix, Janet Finlay, GreGoryd, Abowd, Russell Beale, "*Human – ComputerInteraction*", 3rd edition, Pearson Education, 2004.
4. http://cs.brown.edu/courses/cs295-7/
5. http://www.cs.tufts.edu/~jacob/250bci/

	WIRELESS NETWORKS	L	T	P	C
CS2106	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE	
This Course deals with the fundamental concept of wireless communication systems and networks.	

INSTRUCTIONAL OBJECTIVES	
1.	The basics of wireless communication & how communication takes place in wireless networks.
2.	Cellular communication.
3.	G.S.M and CDMA.
4.	Mobile TCP.

UNIT I - INTRODUCTION   (9 hours)

Wireless transmission – Spread spectrum-Medium Access Control : Motivation for Specialized MAC- SDMA- FDMA- TDMA- CDMA-Comparison of Access Mechanisms-Telecommunications: GSM- DECT- TETRA-Satellite Systems: Basics-Routing- Localization- Handover.

UNIT II - WIRELESS NETWORKS   (9 hours)

Wireless LAN-Infrared Vs Radio Transmission-Infrastructure Networks- Ad hoc Networks- IEEE 802.11-HIPERLAN- Bluetooth- Wireless ATM: Working Group- Services- Reference Model- Functions- Radio Access Layer- Handover- Location Management- Addressing Mobile Quality of Service- Access Point Control Protocol.

UNIT III - MOBILE NETWORK LAYER   (9 hours)

Mobile IP: Goals- Assumptions and Requirement- Entities-IP Packet Delivery- Agent Advertisement and Discovery- Registration- Tunneling and Encapsulation- Optimization- Reverse Tunneling- IPV6- DHCP- Ad hoc Networks.

UNIT IV - MOBILE TRANSPORT LAYER   (9 hours)

Traditional TCP – Indirect TCP- Snooping TCP- Mobile TCP- Fast Retransmit/Fast Recovery- Transmission/Timeout Freezing- Selective Retransmission- Transaction Oriented TCP.

UNIT V - WAP   (9 hours)

Architecture- Datagram Protocol- Transport Layer Security- Transaction Protocol- Session Protocol- Application Environment- Wireless Telephony Application.

REFERENCES

1.   J.Schiller, "*Mobile Communication*", Addison Wesley, 2000.
2.   William Stallings, "*Wireless Communication and Networks*", Pearson Education, 2003.
3.   Singhal, "*WAP-Wireless Application Protocol*", Pearson Education, 2003.
4.   LotherMerk, Martin.S.Nicklaus and Thomas Stober, "*Principle of MobileComputing*",Second Edition, Springer, 2003.
5.   William C.Y.Lee, "*Mobile Communication Design Fundamentals*", John Wiley, 1993.

CS2107	TCP/IP TECHNOLOGY	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course gives a complete understanding of TCP / IP Technology.

INSTRUCTIONAL OBJECTIVES

1.	To study the standards of TCP / IP protocol and addressing types.
2.	To Study various protocols like ARP, RARP, UDP, ICMP, IGMP
3.	To learn Multicasting protocols, SNMP,SMTP and TCP/IP on Embedded Systems and IPV6.
4.	To study the important network protocols and IPV6 standards.
5.	To study the standards of TCP / IP protocol and addressing types.

UNIT I - OSI MODEL AND TCP/IP PROTOCOL SUITE (9 hours) The OSI Model-TCP/IP Protocol Suite Architecture-Addressing-Wired Local Area Networks-Wireless LANS-Point to Point WANS-Switched WANS-Connecting Device.

UNIT II - INTRODUCTION TO NETWORK LAYER   (9 hours)
Switching-Packet Switching Network-Network Layer Services-Network Layer Issues-Classful Addressing-Classless Addressing—Special Addresses-NAT-Delivery-Forwarding Structure of a Router.

UNIT III - INTERNET PROTOCOL   (9 hours)
Datagram – fragmentation – options – checksum – IP package – Address Mapping-ARP Protocol-ARP Package-RARP-ICMP Protocol-Messages-Debugging Tools-ICMP Packages.

UNIT IV -TCP/UDP PROTOCOLS (9 hours) Transport Layer Services – TCP Protocols-TCP Connection-State Transition
Diagrams-Windows in TCP-flow, congestion and error control – TCP package and operation.

UNIT V- IMPORTANT NETWORK PROTOCOLS   (9 hours)
RIP-OSPF-BGP-IGMP-TELNET-DNS-FTP-SMTP-POP-SNMP-TCP/IP on Embedded Systems-The Socket Programming Interface.-IPV6-Terminology-Port Addresses-Header Format-IP Security.

REFERENCES

1.   Behrouz Forouzan, "*TCP/IP protocol suite*",Tata Mc Grawhill, Fourth Edition, 2012.

2. Thomas Herbert, "*LINUX tcp/ip Networking on Embedded Systems*" Cengage Publications, First Edition, 2011.
3. Douglas Comer, "*Internetworking with TCP / IP*",Vol – 1, PHI, First Edition,2000.
4. SidnieFeit, "*TCP/IP Architecture, Protocols and Implementation with IPV6 andIP Security*", Tata McGrawhill, Second Edition, 2008.

	PATTERN RECOGNITION TECHNIQUES	L	T	P	C
CS2108	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE	
To study the Pattern Recognition techniques and its applications	

INSTRUCTIONAL OBJECTIVES	
1.	To learn the fundamentals of Pattern Recognition techniques
2.	To learn the various Statistical Pattern recognition techniques
3.	To learn the various Syntactical Pattern recognition techniques
4.	To learn the Neural Pattern recognition techniques

UNIT I – PATTERN RECOGNITION OVERVIEW (9 hours)

Pattern recognition, Classification and Description—Patterns and feature Extraction with Examples—Training and Learning in PR systems—Pattern recognition Approaches

UNIT II – STATISTICAL PATTERN RECOGNITION (9 hours)

Introduction to statistical Pattern Recognition—supervised Learning using Parametric and Non Parametric Approaches.

UNIT III – LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED
LEARNING AND CLUSTERING (9 hours) Introduction—Discrete and
binary Classification problems—Techniques to directly Obtain linear Classifiers -- Formulation of Unsupervised Learning Problems— Clustering for unsupervised learning and classification.

UNIT IV– SYNTACTIC PATTERN RECOGNITION (9 hours)

Overview of Syntactic Pattern Recognition—Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition—Learning via grammatical inference.

UNIT V– NEURAL PATTERN RECOGNITION (9 hours)

SRM-M.Tech.-CSE-2018

Introduction to Neural networks—Feedforward Networks and training by Back Propagation—Content Addressable Memory Approaches and Unsupervised Learning in Neural PR.

REFERENCES

1. Robert Schalkoff, "*Pattern Recognition: Statistical Structural and NeuralApproaches*", John wiley&sons , Inc,1992.
2. Earl Gose, Richard johnsonbaugh, Steve Jost, "*Pattern Recognition and ImageAnalysis*", Prentice Hall of India,.Pvt Ltd, New Delhi, 1996.
3. Duda R.O., P.E.Hart& D.G Stork, " *Pattern Classification*", 2nd Edition, J.WileyInc 2001.
4. Duda R.O.& Hart P.E., "*Pattern Classification and Scene Analysis*", J.wileyInc, 1973.
5. Bishop C.M., "*Neural Networks for Pattern Recognition*", Oxford University Press, 1995.

	DATA WAREHOUSING AND ITS APPLICATIONS	L	T	P	C
CS2109	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE	
This course provides in-depth knowledge about data warehousing techniques	
INSTRUCTIONAL OBJECTIVES	
1.	To understand the fundamental concepts of data warehousing technology
2.	To learn step-by-step approach to designing and building a data warehouse
3.	To learn case-studies to bring out practical aspects of building a data warehouse

UNIT I - INTRODUCTION TO DATA WAREHOUSING   (8 hours)

Introduction to data warehousing-data Warehouse: Defining features-Architecture of data warehouse-Gathering the business requirements. Planning and project management.

UNIT II - DATA WAREHOUSE SCHEMA   (8 hours)

Data Warehouse schema-Dimensional modeling-ETL Process-Testing, Growth and Maintenance-OLAP in the Data warehouse.

UNIT III - BUILDING A DATA WAREHOUSE   (10 hours)

Building a data warehouse-Introduction-critical success factors-Requirement analysis-Planning for the data warehouse-The data warehouse design stage-Building and

implementing data marts-Building data warehouses-backup and Recovery-Establish the data quality framework-Operating the Warehouse-Recipe for a successful warehouse-Data warehouse pitfalls.

UNIT IV - DATA MINING BASICS   (8 hours)
Data Mining basics-Moving into data mining-Introduction to Web Mining, Text Mining Temporal Data Mining and Spatial Data mining-Issues in Data Mining.

UNIT V - CASE STUDY   (11 hours)
Data Warehousing in the Tamilnadu Government-Data Warehouse for the Ministry of commerce- Data Warehouse for the government of Andhra Pradesh- Data Warehousing in Hewlett –Packard- Data Warehousing in Levi Strauss- Data Warehousing in the World Bank-HARBOR, A Highly available Data Warehouse-A typical Business data Warehouse for a Trading company-Customer data warehouse of the world's first and largest online Bank in the united Kingdom-A German super market EDEKA's Data Warehouse.

REFERENCES
1. ReemaTheraja "*Data Warehousing"* by Oxford University Press-2011.
2. Prabhu C.S.R., *"Data Warehousing Concepts, Techniques, Products andApplications"* PHI Learning Private Limited, Third Edition, 2011.
3. Amitesh Sinha, . "*Data Warehousing"*, Thomson Asia Pte Ltd-2001

	NETWORK SECURITY AND CRYPTOGRAPHY	**L**	**T**	**P**	**C**
CS2110	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE
This course provides a way to understand Network Securit y and different types of Cryptographic techniques. It enables the student to have a mix of fundamental concepts together with practical aspects of security.

INSTRUCTIONAL OBJECTIVES	
1.	To study the Importance of Firewalls and their types.
2.	To study cryptographic algorithms.
3.	To study cryptographic protocols.
4.	To study Wireless security
5.	To study RFID's and E- Passports

UNIT I - INFORMATION SECURITY BASICS AND TYPES OF ATTACKS (9 hours)

Information Security- History- Security as a process, Not Point Products- Access Attacks- Modification Attacks- Denial - of- Service Attacks- Repudiation Attacks- IP Spoofing- Malicious Code

UNIT II - INFORMATION SECURITY SERVICES AND ENCRYPTION   (12 hours)

Information Security Services- Confidentiality- Integrity- Availability- Accountability- Secret key Encryption- DES-AES (Rijndael)- Number Theory – Prime number – Modular arithmetic – Euclid's algorithm - Fermet's and Euler's theorem – Discrete logarithm - Public Key Encryption- Diffie- Hellman Key Exchange- Elliptic Curve Cryptography

UNIT III - FIREWALLS AND INTRUSION   (9 hours)
DETECTION Firewalls– Types of Firewalls –Intrusion Types- Setup and Manage- Detection-Intrusion Prevention

UNIT IV - WIRELESS LAN SECURITY AND CELLPHONE SECURITY (9 hours)

Authentication_ Confidentiality and Integrity- GSM Security- Security UMTS

UNIT V - RFIDS AND E-PASSPORTS   (6 hours)

RFID Basics- applications- Security Issues- Generation 2 tags- Addressing RFID Privacy Concerns- Electronic Passports

REFERENCES

1. Eric Maiwald , "*Fundamentals of Network Security*", Tata McGraw Hill Edition, 2011.
2. Bernard Menezes,"*Network Security and Cryptography*", Cengage Learning, India Edition,2010.
3. Behrouz A.Forouzan, DebdeepMukhopadhyay, "*Cryptography and NetworkSecurity*", Tata McGraw Hill Second Edition, 2010.
4. PallapaVenkataram, "*Wireless and Mobile Network Security*", Tata McGraw Hill Edition, 2010.
5. Terry Parode, Gordon Snyder, "*Network Security*" Cengage Learning, India Edition,2008.
6. William Stallings, "*Cryptography & Network Security*", Pearson Education, 4th Edition 2010.

	GRID COMPUTING	**L**	**T**	**P**	**C**
CS2111	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE
To understand the technology application and tool kits for grid computing

INSTRUCTIONAL OBJECTIVES	
1.	To understand the genesis of grid computing
2.	To know the application of grid computing
3.	To understand the technology and tool kits for facilitating grid computing

UNIT I - INTRODUCTION AND OVERVIEW OF GRID COMPUTING   (9 hours)

Early Grid Activities-Current Grid Activities-An Overview of Grid Business Areas-Grid Applications-Grid Infrastructure

UNIT II - WEB SERVICES AND RELATED TECHNOLOGIES   (9 hours)

Service – Oriented Architecture-Web Service Architecture-XML, Related Technologies, and Their Relevance to Web services-XML Messages and Enveloping-Service Message Description Mechanisms-Relationship between Web Service and Grid Service – Web Service Interoperability and the Role of the WS-I Organization

UNIT III - DISTRIBUTED OBJECT TECHNOLOGY FOR GRID COMPUTING (OGSA)   (9 hours)

Introduction to Open Grid Services Architecture(OGSA)- Commercial Data Center-National Fusion Collaboratory- The OGSA Platform Components 96

UNIT IV - OPEN GRID SERVICES INFRASTRUCTURE (OGSI)   (9 hours)

Introduction-Grid Services-A High-Level Introduction to OGSI – Introduction to Service Data Concepts – Grid Service: Naming and Change Management Recommendations.

UNIT V - OGSA BASIC SERVICES AND THE GRID COMPUTING TOOLKITS
                                                              (9 horurs)

Common Management Model(CMM)-Security Architecture- GLOBUS GT3 Toolkit: Architecture- GLOBUS GT3 Toolkit: - Architecture, Programming model, High level services .

REFERENCES

1. Joshy Joseph & Craig Fellenstein, "*Grid Computing*", Pearson/PHI PTR-2003.
2. Ahmar Abbas, "*Grid Computing: A Practical Guide to technology andApplications*", Charles River media – 2003.
3. http://www.cs.uiowa.edu/~jni/GC/
4. The TeraGrid: http://www.teragrid.org
5. The NSF Middleware initiative: http://www.nsf-middleware.org
6. The Globus Project: http://www.globus.org
7. The Grid Portal Toolkit (Grid Port): http://www.gridport.net
8. The Open Grid Computing Environments Consortium: http://www.ogce.org

9. The GridSphere Project: http://www.gridsphere.org
10. IBM Grid Pages: http://www-1.ibm.com/grid/
11. Univeristy of Texas UT Grid: http://utgrid.utexas.edu

CS2112	NATURAL LANGUAGE UNDERSTANDING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE

This course provides a thorough understanding of Natural language processing techniques

INSTRUCTIONAL OBJECTIVES

1. To learn basics of Speech technology, parsing
2. To understand the semantic analysis of speech
3. To study the machine translation principles

UNIT I – INTRODUCTION   (9 hours)

Regular Expressions and Finite State Automata – Morphology and Finite State Transducers

UNIT II – COMPUTATIONAL PHONOLOGY   (9 hours)

Computational Phonology and Text to speech - N-grams: Counting words in Corpora – Simple N- grams – Smoothing – Entropy

UNIT III – HMMS AND SPEECH RECOGNITION   (9 hours)

HMMS and Speech Recognition: Speech Recognition Architecture – Overview of HMM – Advanced Methods for decoding – Training a speech Recognizer – Human Speech Recognition - Part of Speech Tagging: Rule Based, Stochastic Part-of-Speech Tagging – Transformation Based Tagging-Context Free Grammars for English – Context Free Rules and Trees – Sentence Level Constructions-Coordination – Agreement – Grammars and Human Processing

UNIT IV – PARSING   (9hours)

Parsing with Context Free Grammars – Top down Parser – Problems with Basic Top Down Parser – Finite State Parsing Methods - Representing Meaning: Computational Desiderata for Representations – Meaning Structure of Language – First Order Predicate Calculus- Semantic Analysis: Syntax driven Semantic Analysis – Attached

for a Fragment of English- Integrating Semantic Analysis into the Earley Parser, Robust Semantic Analysis

UNIT V – MACHINE TRANSLATION   (9 hours)

Dialogue and Machine Translation - Dialogue Acts – Automatic, Plan inferential, Cue based Interpretation of Dialogue Acts – Dialogue Structure and coherences – Dialogue Managers - Language Similarities and differences – The Transfer Metaphor – The Interlingua Idea- Direct Translation – Using Statistical Techniques – Usability and System Development

REFERENCES

1. D. Jurafsky and J. Martin , "*Speech and Language Processing: An Introductionto Natural Language Processing, Computational Linguistics, and Speech Recognition*", Pearson Education, 2004
2. C. Manning and H. Schutze , "*Foundations of Statistical Natural LanguageProcessing*", Massachusetts Institute of Technology, 2003.
3. James Allen "*Natural Language Understanding*" ,The Benajmins/Cummings Publishing Company Inc. 1994.

CS2113	DATA MINING CONCEPTS AND TECHNIQUES	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				
PURPOSE					
This course provides a complete overview of Data mining techniques					
INSTRUCTIONAL OBJECTIVES					
1.	To understand the concepts of Data Mining				
2.	To perform different data mining tasks				
3.	To study the applications of Data mining				

UNIT I – INTRODUCTION   (9hours)

Introduction to Data Mining – Kind of Data – Functionalities – Interesting Patterns – Task Primitives – Issues In Data Mining - Data Preprocessing: Why Preprocessing

UNIT II – ASSOCIATION RULES   (9 hours)

Mining Frequent Patterns: Associations And Correlations - Basic Concepts – Frequent Item Set Mining Methods – Mining Various Kinds Of Association Rules

UNIT III – CLASSIFICATION AND PREDICTION   (9 hours)
Issues Regarding Classification and Prediction – Decision Tree Induction Classification – Bayesian, Rule Based Classification – Support Vector Machine

UNIT IV – CLUSTER ANALYSIS   (9 hours)
What Is Cluster Analysis? Types Of Data In Cluster Analysis – A Categorization Of Major Clustering Methods – Hierarchical Methods

UNIT V – APPLICATIONS AND TRENDS IN DATA MINING   (9 hours)
Applications and Trends in Data Mining: Data Mining Applications – Products And Research Prototypes – Additional Themes on Data Mining – Social Impacts of Data Mining

REFERENCES
1. Jiawei Han and Micheline Kamber, *"Data Mining – Concepts and Techniques"*, Second Edition, Morgan Kaufmann Publishers, 2006.
2. M. H. Dunham, *"Data Mining: Introductory and Advanced Topics"*, Pearson Education. 2001.
3. D. Hand, H. Mannila and P. Smyth, "*Principles of Data Mining*", Prentice-Hall. 2001.
4. I H. Witten and E. Frank, "*Data Mining: Practical Machine Learning Tools andTechniques*", Morgan Kaufmann. 2000.

	WIRELESS SENSOR NETWORKS AND PROGRAMMING	L	T	P	C
CS2114	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE
This course provides a broad coverage of challenges and research results related to the design and management of wireless sensor networks
INSTRUCTIONAL OBJECTIVES

1.	To understand the concepts of sensor networks
2.	To learn how to program sensor motes
3.	To understand the challenging issues in each layer of sensor networks

UNIT I - FUNDAMENTALS OF SENSOR NETWORKS   (9 hours)

Introduction and Overview - Overview of sensor network protocols, architecture, and applications, Challenges, Main features of WSNs; Research issues and trends, Platforms-Standards and specifications-IEEE802.15.4/Zigbee, Hardware: Telosb, Micaz motes ,Software: Overview of Embedded operating systems-Tiny OS, Introduction to Simulation tools- TOSSIM, OPNET, Ns-2.

UNIT II - COMMUNICATION CHARACTERISTICS AND DEPLOYMENT
MECHANISMS (9 hours) Wireless Communication characteristics - Link quality, fading effects, Shadowing, Localization, Connectivity and Topology - Sensor deployment mechanisms, Coverage issues, Node discovery protocols.

UNIT III - MAC LAYER   (9 hours)
Fundamentals of Medium access protocol- Medium access layer protocols - Energy efficiency, Power allocation and Medium access control issues.

UNIT IV - NETWORK LAYER AND TRANSPORT LAYER   (9 hours)
Network layer protocols-Data dissemination and processing, multichip and cluster based routing protocols- Energy efficient routing- Geographic routing, Transport layer-Transport protocol Design issues- Performance of Transport Control Protocols.

UNIT V - MIDDLEWARE AND SECURITY ISSUES   (9 hours)
Middleware and Application layer -Data dissemination, Data storage, Query processing, Security -Privacy issues, Attacks and Countermeasures

REFERENCES
1. WaltenegusDargie, Christian Poellabauer , "*Fundamentals of Wireless SensorNetworks, Theory and Practice*", Wiley Series on wireless Communication andMobile Computing, 2007.
2. KazemSohraby, Daniel manoli , "*Wireless Sensor networks-Technology,Protocols and Applications*", Wiley InterScience Publications 2010.
3. BhaskarKrishnamachari ,"*Networking Wireless Sensors*", Cambridge University Press, 2005.
4. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , "*Wireless SensorNetworks*", Springer Science 2004.,

	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
CS2115	Total Contact Hours – 45	3	0	0	3
	Prerequisite				
	Nil				
PURPOSE					

To learn the fundamentals and techniques of Service Oriented Architecture
INSTRUCTIONAL OBJECTIVES

1.	Service Oriented Architecture Concepts
2.	Web Services and Service Orientation
3.	Service Oriented Design

UNIT I - INTRODUCTION (9 hours)

Fundamental SOA-Common characteristics of contemporary SOA- Common misperceptions about SOA-Common tangible benefits of SOA- Common pitfalls of adopting SOA-The Evolution of SOA-An SOA timeline (from XML to Web services to SOA)- The continuing evolution of SOA (standards organizations and contributing vendors)- The roots of SOA (comparing SOA to past architectures)-Web Services and Primitive SOA- The Web services framework- Services (as Web services)-Service descriptions (with WSDL)-Messaging (with SOAP).

UNIT II - WEB SERVICES AND CONTEMPORARY SOA INTRODUCTION AND ISSUES (9 hours)

Message exchange patterns- Service activity-coordination-Atomic transactions-Business activities-Orchestration-Choreography- Addressing- Reliable messaging-Correlation-Policies- Metadata exchange- Security- Notification and eventing

UNIT III - SOA AND SERVICE-ORIENTATION (9 hours)

Principles of Service-Orientation-Service-orientation and the enterprise- Anatomy of a service-oriented architecture- Common principles of service-orientation- How service-orientation principles inter-relate-Section-Service-orientation and object-orientation- Native Web service support for service-orientation principles-Service Layers-Service orientationandcontemporary SOA- Service layer abstraction-application service layer-Business service layer- Orchestration service layer-Agnostic services- Service layer configuration scenarios.

UNIT IV - BUILDING SOA (PLANNING AND ANALYSIS) (9 hours)

SOA Delivery Strategies- SOA delivery lifecycle phases- The top-down strategy- The bottom-up strategy- The agile strategy- Service-Oriented Analysis - Introduction service-oriented analysis- Benefits of a business-centric SOA- Deriving business services-Service-Oriented Analysis- Service modeling (a step-by-step process)-Service modeling guidelines- Classifying service model logic- Contrasting service modeling approaches (an example)

UNIT V - SERVICE-ORIENTED DESIGN (9 hours)

Introduction to service-oriented design- WSDL-related XML Schema language basics-WSDL language basics- SOAP language basics- Service interface design tools-Steps

to composing SOA-Considerations for choosing service layers and SOA standards, positioning of cores and SOA extensions -Overview-Service design of business service, application service, taks centric service and guidelines - Service-Oriented Design (Business Process Design)-WS-BPEL language basics-WS-Coordination overview- Service-oriented business process design (a step-by-step process).

REFERENCES

1. Thomas Erl , "*Service-Oriented Architecture: Concepts,Technology& Design*", Pearson Education Pvt. Ltd 2008.
2. Thomas Erl, "*SOA Principles Of Service Design*", Pearson Education, 2007.
3. Tomas Earl and Grady Booch,"*SOA Design Patterns*", Prentice Hall 2008.

	CLOUD COMPUTING	L	T	P	C
CS2116	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE
This course impart wide knowledge on cloud services,cloud management and cloud virtualization technologies

INSTRUCTIONAL OBJECTIVES
1. To understand cloud services and solutions
2. To know about cloud virtualization technologies and cloud management
3. To understand the relevance of Cloud, SOA and benchmarks

UNIT I – INTRODUCTION (9 hours) Introduction - Essentials - Benefits - Business and IT Perspective - Cloud and Virtualization -Cloud Services Requirements - Cloud and Dynamic Infrastructure -
Cloud Computing Characteristics - Cloud Adoption. Cloud Models - Cloud Characteristics - Measured Service - Cloud Models - Security in a Public Cloud - Public versus Private Clouds - Cloud Infrastructure Self Service.

UNIT II – CLOUD SERVICES AND SOLUTIONS   **(9 hours)**
Gamut of Cloud Solutions - Principal Technologies - Cloud Strategy - Cloud Design and Implementation using SOA - Conceptual Cloud Model - Cloud Service Defined. Cloud Solutions - Introduction - Cloud Ecosystem - Cloud Business Process Management - Cloud Service Management - Cloud Stack - Computing on Demand (CoD) – Cloudsourcing.

UNIT III – CLOUD OFFERINGS AND CLOUD MANAGEMENT   **(9 hours)**

Cloud Offerings - Information Storage, Retrieval, Archive and Protection - Cloud Analytics - Testing under Cloud - Information Security - Virtual Desktop Infrastructure - Storage Cloud.Cloud Management - Resiliency - Provisioning - Asset Management - Cloud Governance - High Availability and Disaster Recovery - Charging Models, Usage Reporting, Billing and Metering

UNIT IV– CLOUD VIRTUALIZATION TECHNOLOGY   (9 hours)

Virtualization Defined - Virtualization Benefits - Server Virtualization - Virtualization for x86 Architecture - Hypervisor Management Software - Logical Partitioning (LPAR) - VIO Server - Virtual Infrastructure Requirements - Storage virtualization - Storage Area Networks - Network-Attached storage - Cloud Server Virtualization - Virtualized Data Center

UNIT V – CLOUD, SOA AND INFRASTRUCTURE BENCHMARKING (9 hours)

SOA and Cloud - SOA Defined - SOA and IaaS - SOA-based Cloud Infrastructure Steps - SOA Business and IT Services. OLTP Benchmark - Business Intelligence Benchmark - e-Business Benchmark - ISV Benchmarks Cloud Performance Data Collection and Performance Monitoring Commands Benchmark Tools.

REFERENCES

1. Kumar Saurabh, "*Cloud Computing: Insights into New-Era Infrastructure*", Wiley India, 2011.
2. John Rhoton, "*Cloud Computing Explained: Implementation Handbook forEnterprises*", Recursive Press, 2013.
3. George Reese, "*Cloud Application Architectures: Building Applications andInfrastructure in the Cloud (Theory in Practice)*", O'Reilly, 2009.

CS2117	TRUSTED COMPUTING	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisitel				
	Ni				
PURPOSE					
This course provides in-depth knowledge on trust computing in networks					
INSTRUCTIONAL OBJECTIVES					
1.	To learn the concepts of trust categories				
2.	To understand trust architecture and formalization of security properties				
3.	To learn trusted computing and administration				

UNIT I – INTRODUCTION   (9 hours)

Introduction – Trust and Computing – Instantiations – Design   and Applications – Progression – Motivating scenarios – Attacks. Design goals of the trusted platform modules. Introduction to simulators – Implementation of attacks

UNIT II – ARCHITECTURE, VALIDATION AND APPLICATION CASE STUDIES
(9hours)

Foundations – Design challenges – Platform Architecture – Security architecture – erasing secrets – sources – software threats – code integrity and code loading. Outbound Authentication – Problem – Theory – Design and Implementation - Validation – Process – strategy – Formalizing security properties – Formal verification – other validation tasks – reflection. Application case studies – Basic building blocks – Hardened web servers – Right's management for Big Brother's computer – Private Information – Other projects. TCPA/TCG

UNIT III – PROGRAMMING INTERFACES TO TCG   (9 hours)

Experimenting with TCPA/TCG – Desired properties- Lifetime mismatch –Architecture – Implementation – Applications. Writing a TPM device driver- Low-level software – Trusted boot – TCG software stack – Using TPM keys. Implementation using simulator tools.

UNIT IV – TSS CORE SERVICE AND SECURE STORAGE   (9 hours)

TSS core service – Public key cryptography standard – Architecture – Trusted computing and secure storage – Linking to encryption algorithms – encrypting files and locking data to specific PCs-content protection – secure printing and faxing. Simulation analysis of symmetric and public key cryptographic standards - performance evaluation of these trust models.

UNIT V– TRUSTED COMPUTING AND SECURE IDENTIFICATION   (9 hours)

Trusted Computing and secure identification – Administration of trusted devices – Secure /backup maintenance – assignment of key certificates-secure time reporting-key recovery – TPM tools- Ancillary hardware.

REFERENCES

1. Sean W.Smith, "*Trusted Computing Platforms: Design and Applications*". Springer Science and Business media, 2005.
2. Challener D., Yoder K., Catherman R., Safford D., Van Doorn L.. "*A PracticalGuide to Trusted Computing*". IBM press, 2008.
3. Xujan Zhou, Yue Xu, Yuefeng Li, AudunJøsang, and Clive Cox. "*The state-of-the-art in personalized recommender systems for social networking*". ArtificialIntelligence Review, Issue C, pp. 1-14, Springer, 2011.

MA2013	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	L	T	P	C
	Total Contact Hours - 45	3	0	0	3
	Prerequisite				
	Nil				

PURPOSE
To impart analytical ability and to solve real life problems pertaining to branches of Computer Science and Engineering.

INSTRUCTIONAL OBJECTIVES	
1.	To be exposed with logic
2.	To be thorough in mathematical induction
3.	To understand algebraic systems such as relations
4.	To be familiar with the basic concepts of lattices

UNIT I – LOGIC (9 hours)

Logic - Statements - Connectives - Truth tables - Normal forms - Predicate calculus - Inference Theory for Statement calculus and predicate calculus.

UNIT II – COMBINATORICS (9 hours)

Combinatory - Mathematical Induction - Pigeonhole principle - Principle of inclusion and exclusion.

UNIT III - RECURSIVE FUNCTIONS (9 hours)

Recursive Functions- Recurrence relation - Solution of recurrence relation using characteristic polynomial and using generating function - Recursive functions - Primitive recursive functions, Computable and non computable functions.

UNIT IV - ALGEBRAIC STRUCTURES (9 hours)

Algebraic Structures - Groups - Definition and examples only - Cyclic groups Permutation group (Sn and Dn) - Subgroups - Homomorphism and Isomorphism - Cosets - Lagrange's Theorem - Normal subgroups - Cayley's representation theorem.

UNIT V – LATTICES (9 hours)

Lattices - Partial order relations, Poset - Lattices, Hasse diagram - Boolean algebra.

REFERENCES

1. Tremblay J.P. and Manohar R., "*Discrete Mathematical Structures withapplications to Computer Science*", McGraw Hill International Edition,

1987Kenneth H. Rosen, Discrete Mathematics and Its Applications, 4th Edition, Tata McGraw Hill, 2002.

2. Venkataraman M.K. etal., "*Discrete Mathematics*", National Publishing Co.,2000.
3. Prof. Sundaresan V., Ganapathy Subramanian K.S.andGanesan K., "*DiscreteMathematics*", New Revised Edition, 2001.
4. Alan Doerr and Kenneth Levasseur, "*Applied Discrete Structures for ComputerScience*", Galgotia Publications (P) Ltd.,1992.
5. Liu C.L., "*Elements of Discrete Mathematics*", 2nd Edition, McGraw Hill Publications, 1985.
6. Gersting. J.L. , "*Mathematical Structures for Computer Science*", 3rd Edition, W.H. Freeman and Co., 1993.
7. Lidl and Pitz, "*Applied abstract Algebra*", Springer - Verlag, New York, 1984.

	GRAPH THEORY AND OPTIMIZATION TECHNIQUES	**L**	**T**	**P**	**C**
MA2010	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE

To develop analytical capability and to impart knowledge in graphs, linear programming problem and statistical methods and their applications in Engineering & Technology and to apply their concepts in engineering problems they would come across

INSTRUCTIONAL OBJECTIVES

1. student should be able to understand graphs ,linear programming problems and statistical concepts.

2. Students problems should be able to apply the concepts in solving the Engineering

UNIT I - BASICS OF GRAPH THEORY   (9 hours)

Graphs - Data structures for graphs - Subgraphs - Operations on Graphs Connectivity – Networks and the maximum flow - Minimum cut theorem - Trees - Spanning trees - Rooted trees – Matrix representation of graphs.

UNIT II - CLASSES OF GRAPHS   (9 hours)

Eulerian graphs and Hamiltonian graphs - Standard theorems - Planar graphs - Euler's formula - Five colour theorem - Coloring of graphs - Chromatic number (vertex and edge) properties and examples - Directed graphs

UNIT III- GRAPH ALGORITHM   (9 hours)

Computer Representation of graphs - Basic graph algorithms - Minimal spanning tree algorithm - Kruskal and Prim's algorithm - Shortest path algorithms - Dijsktra's algorithm - DFS and BFS algorithms.

UNIT IV - OPTIMIZATION TECHNIQUES   (9 hours)

Linear programming – Graphical methods – Simplex method (Artificial variables not included) – Transportation and assignment problems.

UNIT V – STATISTICS   (9 hours)

Tchebyshev′s inequality – Maximum likelihood estimation – Correlation – Partial correlation – Multiple correlations.

REFERENCES

1. NarsinghDeo, "*Graph Theory with Applications to Engineering and ComputerScience*", PHI 1974.
2. Rao S.S., "*Engineering Optimization: Theory and Practice*", New Age International Pvt. Ltd., 3rd Edition 1998.

	STOCHASTIC PROCESSES & QUEUEING THEORY	L	T	P	C
MA2011	Total Contact Hours - 45	**3**	**0**	**0**	**3**
	Prerequisite				
	Nil				

PURPOSE
To impart knowledge on probability concepts to study their applications in stochastic processes & queueing theory

INSTRUCTIONAL OBJECTIVES	
1.	Compute the characteristics of the random variable given the probabilities
2.	Understand and apply various distribution
3.	Solve cases of different Stochastic processes along with their properties.
4.	Use discrete time finite state Markov chains
5.	Gain sufficient knowledge in principles of queueing theory

UNIT I - RANDOM VARIABLES   (9 hours)

One dimensional and two dimensional Random Variables – Characteristics of Random Variables : Expectation, Moments.

UNIT II - THEORETICAL DISTRIBUTIONS   (9 hours)

Discrete : Binomial, Poisson, Negative Binomial, Geometric, Uniform Distributions. Continuous: Uniform, Exponential, Erlang and Gamma, Weibull Distributions.

UNIT III - STOCHASTIC PROCESSES   (9 hours)

Classification of Stochastic Processes – Bernoulli process – Poisson process – Pure birth process – Birth and Death process.

UNIT IV - MARKOV CHAINS   (9 hours)

Introduction – Discrete-Parameter Markov Chains – Transition Probability Matrix – Chapman Kolmogorov Theorem – State classification and limiting distributions.

UNIT V- QUEUING THEORY   (9 hours)

Introduction – Characteristics of Markovian Single server and Multi server queuing models [(M/M/1) : (∞ / FIFO), (M/M/1) : (N / FIFO), (M/M/s) : (∞ /FIFO)] – M/G/1 Queuing System – PollaczekKhinchin formula.

REFERENCES

1. Kishore.S.Trivedi, "*Probability & Statistics with Reliability, Queuing andComputer Science Applications*", PHI, New Delhi, 1995.
2. Veerajan T, "*Probability, Statistics and Random Processes*", 3rd Edition Tata McGraw Hill, New Delhi, 2002.
3. Gupta S.C and Kapoor V.K, "*Fundamentals of Mathematical Statistics*", 9th revised edition, Sultan Chand & Co., New Delhi 2003.
4. Gross.D and Harris.C.M. "*Fundementals of Queuing theory*", John Wiley and Sons, 1985.
5. Allen.A.O., "*Probability, Statistics and Queuing Theory*", Academic Press, 1981.

SEMESTER I

CAC2001	Career Advancement Course For Engineers - I	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				
PURPOSE						
To enhance holistic development of students and improve their employability skills						

INSTRUCTIONAL OBJECTIVES

1. To improve aptitude, problem solving skills and reasoning ability of the student.
2. To collectively solve problems in teams & group.

3. Understand the importance of verbal and written communication in the workplace
4. Understand the significance of oral presentations, and when they may be used.
5. Practice verbal communication by making a technical presentation to the class
6. Develop time management Skills

UNIT I–BASIC NUMERACY
🕐   Types and Properties of Numbers, LCM, GCD, Fractions and decimals, Surds

UNIT II-ARITHMETIC – I
🕐   Percentages, Profit & Loss, Equations

UNIT III-REASONING - I
🕐   Logical Reasoning

UNIT IV-SOFT SKILLS - I
🕐   Presentation skills, E-mail Etiquette

UNIT V-SOFT SKILLS - II
🕐   Goal Setting and Prioritizing

ASSESSMENT

Soft Skills (Internal)
Assessment of presentation and writing skills.

Quantitative Aptitude (External)
Objective Questions- 60 marks
Descriptive case lets- 40 marks*
Duration: 3 hours
*Engineering problems will be given as descriptive case lets.

REFERENCE:

1. Quantitative Aptitude by Dinesh Khattar – PearsonsPublicaitons
2. Quantitative Aptitude and Reasoning by RV Praveen – EEE Publications
3. Quantitative Aptitude by AbijithGuha – TATA Mc GRAW Hill Publications

4. Soft Skills for Everyone by Jeff Butterfield – Cengage Learning India Private Limited
5. Six Thinking Hats is a book by Edward de Bono - Little Brown and Company
6. IBPS PO - CWE Success Master by Arihant - Arihant Publications(I) Pvt.Ltd – Meerut

SEMESTER II

CAC2002	Career Advancement Course For Engineers - II	L	T	P	C
	Total Contact Hours - 30	1	0	1	1
	Prerequisite				
	Nil				
PURPOSE					
To enhance holistic development of students and improve their employability skills					

INSTRUCTIONAL OBJECTIVES

1. To improve aptitude, problem solving skills and reasoning ability of the student.
2. To collectively solve problems in teams & group.
3. Understand the importance of verbal communication in the workplace
4. Understand the significance of oral presentations, and when they may be used.
5. Understand the fundamentals of listening and how one can present in a group discussion
6. Prepare or update resume according to the tips presented in class.

UNIT I-ARITHMETIC – II
🕐   Ratios & Proportions, Mixtures & Solutions

UNIT II - MODERN MATHEMATICS
🕐   Sets & Functions, Data Interpretation, Data Sufficiency

UNIT III – REASONING - II
🕐   Analytical Reasoning

UNIT IV – COMMUNICATION - I

UNIT V - COMMUNICATION - II
⏱   Verbal Reasoning test papers

ASSESSMENT
Communication (Internal)

☐   Individuals are put through formal GD and personal interviews.
☐   Comprehensive assessment of individuals' performance in GD & PI will be carried out.

Quantitative Aptitude (External)

Objective Questions- 60 marks (30 Verbal +30 Quants)
Descriptive case lets- 40 marks*
Duration: 3 hours
*Engineering problems will be given as descriptive case lets.

REFERENCES
1. Quantitative Aptitude by Dinesh Khattar – PearsonsPublicaitons
2. Quantitative Aptitude and Reasoning by RV Praveen – EEE Publications
3. Quantitative Aptitude by AbijithGuha – TATA Mc GRAW Hill Publications
4. General English for Competitive Examination by A.P. Bharadwaj – Pearson Educaiton
5. English for Competitive Examination by Showick Thorpe - Pearson Educaiton
6. IBPS PO - CWE Success Master by Arihant - Arihant Publications(I) Pvt.Ltd - Meerut
7. Verbal Ability for CAT by Sujith Kumar - Pearson India
8. Verbal Ability & Reading Comprehension by Arun Sharma - Tata McGraw – Hill Education

SEMESTER III

CAC2003	Career Advancement Course For Engineers - III	L	T	P	C
	Total Contact Hours - 30	**1**	**0**	**1**	**1**
	Prerequisite				
	Nil				

PURPOSE
To develop professional skills abreast with contemporary teaching learning methodologies

INSTRUCTIONAL OBJECTIVES
At the end of the course the student will be able to

1	acquire knowledge on planning, preparing and designing a learning program
2	prepare effective learning resources for active practice sessions
3	facilitate active learning with new methodologies and approaches
4	create balanced assessment tools
5	hone teaching skills for further enrichment

UNIT I- DESIGN   **(2 hrs)**
- Planning &Preparing a learning program.
- Planning & Preparing a learning session

UNIT II – PRACTICE   **(2 hrs)**
- Facilitating active learning
- Engaging learners

UNIT III – ASSESSMENT   **(2 hrs)**
- Assessing learner's progress
- Assessing learner's achievement

UNIT IV – HANDS ON TRAINING   **(10 hrs)**
- Group activities – designing learning session
- Designing teaching learning resources
- Designing assessment tools
- Mock teaching session

UNIT V – TEACHING IN ACTION   **(14 hrs)**
- Live teaching sessions

⏱   Assessments

ASSESSMENT (Internal)

Weightage:
Design - 40%
Practice – 40%
Quiz – 10%
Assessment – 10%

REFERENCES

Cambridge International Diploma for Teachers and Trainers Text book by
Ian Barker - Foundation books
Whitehead, Creating a Living Educational Theory from Questions of the
kind: How do I improve my Practice? Cambridge J. of Education

AMENDMENTS

S.No.	Details of Amendment	Effective from	Approval with date