SCHOOL
OF
INFORMATION AND COMMUNICATION TECHNOLOGY

COURSE STURCTURE

M. TECH.

COMPUTER SCIENCE

GAUTAMBUDDHAUNIVERSITY
GAUTAM BUDH NAGAR, GREATER NOIDA
2015-2016

M. Tech. CSE **Effective from: 2014 -2015**

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SEMESTER I

Sr. No.	Courses Code	Courses	L-T-P		Credits
1	CS521	Advanced Data Base Management System	3-1-0	C1	4
2	CS523	Advanced Computer Architecture	3-1-0	C2	4
3	CS525	Intelligent System Design	3-1-0	C3	4
4	CS527	Research Techniques in ICT	3-1-0	SEC1	4
5	---	Open Elective-1	3-0-0	OE1	3
6	CS581	Advanced Data Base Management System Lab	0-0-3	C4	2
7	CS585	Intelligent System Design Lab	0-0-3	C5	2
8	GP	General Proficiency	------	NCC	
Total Credits					**23**
Total Contact Hours				**14-3-6 =**	**23**

Open Electives-I
Electives from other school

SEMESTER – II

Sr. No.	Courses Code	Courses	L-T-P		Credits
1		Generic Elective	3-1-0	GE1	4
2	CS532	Advanced Software Engineering	3-0-0	C6	3
3	CS574	Advanced Data Structure and Algorithm Design	3-0-0	C7	3
4	CS576	Advanced Operating Systems	3-0-0	C8	3
5		**Elective-1**	3-0-0	DSE1	3
6	CS582	Advanced Data Structure & Algorithm DesignLab	0-0-3	C9	2
7	CS592	Major Project	0-0-10	DP1	5
8	GP532	General Proficiency	------	NCC	0
Total Credits					**23**
Total Contact Hours				**15-1-13 =**	**31**

Electives (1)		
1	CS578	Cloud Computing
2	EC531	Advanced Digital Communication Systems
3	CS586	AI and Neural Networks
4	CS588	Advanced Internet Technology
5	CS590	High Speed Networks
6	CS564	Soft Computing Techniques
7	CS592	Advanced Java Programming
9	CS 596	Wireless Mobile Networks
10	CS 598	Embedded Linux

11	CS552	Any skill based course by NSDC*credits will be decided when the course is run.

Generic Elective (GE2)

1. MA 402 Modeling and Simulation
   MA416 Probability and Stochastic Process

SEMESTER III

Sr. No.	Courses Code	Courses	L-T-P		Credits
1	CS695	Computer Security	3-0-0	C10	3
2	CS673	Computer Networks and Distributed Systems	3-0-0	C11	3
3		**Electives –2**	3-0-0	DSE2	3
4	CS655	Industrial Practices in Software Engineering	2-0-0	DSE3	2
5	CS683	Industrial Practices in Software Engineering	0-0-6	DSE4	3
6	CS691	Dissertation Part - I	0-0-14	DP2	7
7	GP631	General Proficiency	------	NCC	0
		Total Credits			**21**
		Total Contact Hours		**12-0-17 =**	**29**

Electives (2)		
1	CS641	Aspect-Oriented Software Engineering
2	CS675	Multimedia and Computer Graphics
3	CS677	Information Theory and Coding
4	CS679	Fuzzy Set Theory
5	CS693	Parallel Computing
6	EC635	Mobile Computing
7	CS 680	Analytical Models for computing System
8	CS 697	Ad-Hoc Networks
9	CS671	Image Processing and Pattern Recognition
10	CS685	Computer Networks and Distributed Systems Lab

SEMESTER IV

Sr. No.	Courses Code	Courses	L-T-P		Credits
1	CS690	Dissertation Part – II	------	DP3	23
2	GP632	General Proficiency	------	NCC	
		Total Credits			**23**

GRAND TOTAL CREDITS = 90

ADVANCED DATA BASE MANAGEMENT SYSTEM			
Course Code:	**CS521**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO DATABASE DESIGN

Entities, Attributes, Entity Sets, Relationships, Key Constraints, Participation Constraints, Weak Entities, UML Class Diagrams, Subclasses, Superclasses, Inheritance,Specialization, Generalization, Constraints and Characteristics of Specialization and Generalization Hierarchies, Modeling of UNION Types Using Categories, Representing Specialization and Generalization In UML Class Diagrams, Data Abstraction, Knowledge Representation and Ontology Concepts.

UNIT II DATABASES DESIGN THEORY

Problems Caused by Redundancy, Decompositions, Problems Related to Decomposition, Reasoning About FD's, FIRST, SECOND, THIRD Normal Form, BCNF, Forth Normal Form, Lossless Join Decomposition, Dependency Preserving Decomposition, Schema Refinement in Data Base Design, Multi Valued Dependencies.

UNIT III OBJECT- ORIENTED, PARALLEL AND DISTRIBUTED DATABASES

Overview of Object-Oriented Concepts, Object Identity, Object Structure, Type Constructor, Encapsulation of Operations, Methods and Persistence; Architectures For Parallel Databases, Parallel Query Evaluation, Parallelizing Individual Operations, Sorting Joins, Distributed Database Concepts, Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design, Query Processing in Distributed Databases, Concurrency Control and Recovery in Distributed Databases.

UNIT IV DATABASES ON THE WEBANDSEMI–STRUCTURED DATA

Web interface, XML, structure of XML data, querying XML data, storage of XML data, XML applications, semi-structured data model, indexes for text data.

UNIT V ENHANCED DATA MODELS FOR ADVANCED APPLICATIONS

Active database concepts, temporal database concepts, spatial databases: concept and architecture, deductive databases and query processing, mobile databases, Geographic Information Systems (GIS).

Text Books:

1. Elmsari and Navathe, Fundamentals of Database Systems,
2. Ramakrishnan and Gehrke, Database Management Systems,

References Books:

3. Korth, Silberschatz, Sudarshan, Database System Concepts,
4. Rob and Coronel, Database Systems: Design, Implementation and Management,
5. Date and Longman, Introduction to Database Systems,

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ADVANCED COMPUTER ARCHITECTURE			
Course Code:	**CS523**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I

Introduction to parallel processing: parallelism in uniprocessor system, basic uniprocessor architecture, parallel processing mechanism, balancing of sub system bandwidth, multiprogramming and time sharing, parallel computer structures, pipeline computers, array computers, multiprocessor systems, dataflow computer concept, architectural classification scheme: multiplicity of instruction-data streams, serial versus parallel processing, parallelism versus pipelining, parallel processing applications, productive modeling simulation, engineering design and automation.

UNIT II

Principles of pipelining and vector processing: pipelining- an overlapped parallelism, principles of linear pipelining, clock period, efficiency, throughput, classification of pipeline processors, general pipeline and reservation tables.

UNIT III

Principles of designing pipeline processors: effect of branching, data buffering and bussing structures, internal forwarding and register tagging, hazard detection and resolution, job sequencing and collision prevention, reservation and latency analysis, collision free scheduling, state diagram, greedy cycle, pipeline schedule optimization, pipeline throughput, pipeline efficiency.

UNIT IV

Structure and algorithm for array processors: SIMD array processor, SIMD computer organization, inter –PE communication, SIMD interconnection network, static versus dynamic networks, cube interconnection network, shuffle-exchange omega networks, parallel algorithms and SIMD matrix multiplication.

UNIT V

Multiprocessor architecture and scheduling: functional structure, loosely coupled and tightly coupled multiprocessor, deterministic scheduling strategy, deterministic scheduling model, control flow versus data flow computer, data flow graphs and languages.

References Books:

1. Kai Hwang, “Advanced Computer Architecture”, Tata McGrawHill Edition
2. Kai Hwang and Faye A. Briggs, “Computer Architecture and Parallel Processing”, McGraw-Hill International Edition
3. Richard Y. Kain, “Advanced Computer Architecture: a Systems Design”, Prentice Hall.
4. James M. Feldman, Charles T. Retter, “Computer architecture: a designer's Text Based on a generic RISC”, McGraw-Hill
5. Jurij Silc, Borut Robic, Theo Ungerer, “Processor Architecture: From Dataflow to Superscalar and Beyond”, Springer.
6. Hennessy and Patterson, “Computer Architecture: A Quantitative Approach”, Elsevier.
7. Dezso and Sima, “Advanced Computer Architecture”, Pearson.
8. Quinn, “Parallel Computing: Theory & Practice”, TMH.
9. Quinn, “Parallel Programming in C with MPI and Open MP”, TMH

INTELLIGENT SYSTEM DESIGN			
Course Code:	**CS525**	**Credits:**	**4**
No. of Lectures (Hrs/Week):	**3+1**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45+15**	**End Sem Exam Hours:**	**3**

UNIT I
INTRODUCTION TO ARTIFICIAL INTELLIGENCE
Basic concept of artificial intelligence (AI), history of AI, AI and consciousness, weak and strong AI, physical symbol system hypothesis, comparison of computer and human skills, practical systems based on AI, development of logic, components of AI.

UNIT II
PROBLEM SOLVING THROUGH AI
Defining problem as state space search, analyzing the problem, representing the problems from AI viewpoint, production system, developing production rules, characteristics of production system, algorithm for problem solving using AI technique.

UNIT III
SEARCH TECHNIQUES
Use of search in AI problem solution, blind search techniques, heuristic search techniques, concept of heuristic knowledge, designing of the heuristic function, types of heuristic search techniques: generate and test, best first search, problem reduction using AND – OR graph, local search technique, branch and bound search, memory bounded search technique, local beam search, properties of heuristic search techniques, overestimation and underestimation of heuristic function, hill climbing search, simulated annealing search, constraint satisfaction, means ends analysis.

UNIT IV
INTRODUCTION TO LOGIC
Introduction, propositional calculus, syntax of propositional calculus, semantics of propositional calculus, well formed formula, properties of statements, inferencing of propositional logic, predicate logic, syntax of predicate logic, semantics of predicate logic, representation of facts First Order Predicate Logic (FOPL), inferencing in predicate logic, concept of resolution, resolution algorithm, skolemization, Types of resolution, unit resolution, binary resolution.

UNIT V
PROLOG and LISP
Basic concept of programming languages related to artificial intelligence problems, concept of programming in Logic, basic prolog constructs, atoms, defining the rules, writing small programs in prolog, concept of list processing, basic LISP constructs, writing functions in LISP, some simple programs of LISP.

Reference books:
1. Artificial Intelligence, Elanie Reich: Tata mcgraw Hill publishing house, 2008.
2. Artificial intelligence, Peterson, TataMcGraw Hill, 2008.
3. Artificial intelligence, Russel and Norvig, Pearson Printice Hall Publication, 2006.
4. Artificial Intelligence, Winston, PHI publication, 2006.

RESEARCH TECHNIQUES IN ICT			
Course Code:	**CS527**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION TO RESEARCH TECHNIQUES

Meaning of research, objectives of research, motivation in research, types of research (Introduction to experimental test bed, algorithmic research, simulation research, mathematical modeling approach), characteristics and prerequisites of research, significance of research, research process, sources of research problem, criteria of identifying the problem, necessity of defining the problem, errors in selecting research problem, technique involved in defining the problem, report and paper writing.

UNIT II DATA ANALYSIS ANDSTATISTICAL TECHNIQUES

Data and their analyses, quantitative methods and techniques, Measure of central tendency, measures of variation, frequency distribution, analysis of variance, methods, Correlation analysis, regression analysis, time series and forecasting, introduction to discriminant analysis, factor analysis, cluster analysis, conjoint analysis, probability distribution, binomial distribution, poisson distribution, uniform distribution, exponential distribution, and normal distribution, sampling methods, test of hypothesis.

UNIT III MATHEMATICAM MODELING

Steps of modeling, operations research models like queuing theory, stochastic processes, application of models, conceptual framework development and validation techniques, optimization techniques.

UNIT IV ALGORITHMIC RESEARCH

Algorithmic research problems, types of algorithmic research, types of solution procedure, steps of development of algorithm, steps of algorithmic research, design of experiments,

UNIT V SIMULATION ANDSOFT COMPUTING TECHNIQUES

Introduction to soft computing, artificial neural network, genetic algorithm, fuzzy logic and their applications, tools of soft computing, need for simulation, types of simulation, simulation language, fitting the problem to simulation study, simulation models, output analysis, data simulation packages like MATLAB, NS2, ANSYS, Cadence.

Reference Books:

1. Research Methodologies, R. Panneerselvam, Prentice Hall, 2007.
2. Research in Education, Best John V. and James V Kahn, Wiley eastern, 2005.
3. Elements of Educational Research, Sukhia, S.P., P.V. Mehrotra, and R.N. Mehrotra, PHI publication, 2003.
4. Methodology of Research Education, K. Setia, IEEE publication, 2004.
5. Research methodology, Methods and Techniques, Kothari, C.R., 2000.

ADVANCED DBMS LAB			
Course Code:	**CS581**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3**		
Total No. of Lectures:	**10**	**End Sem Exam Hours:**	**2**

Programs/Experiments List:

1. Introduction to MySQL, Postgre Sql, Microsoft Sql softwares.
2. An exercise of data types in PostGresql & Data Definition Language Commands
3. Exercise on Data Manipulation Language and Transaction Control Commands using PostgreSql.
4. Exercise on Types of Data Constraints using PostgreSql.
5. Exercise on JOINS (Single-Table) Using Normalization
6. Exercise on JOINS (Multiple-Table) Using Normalization
7. Exercise on GROUP BY/ORDER BY Clause and Date Arithmetic using PostgreSql.
8. Exercise on different Functions (Aggregate, Math and String)
9. Exercise on different types of sub queries
10. Procedures
11. View
12. Triggers

Intelligent System Design Lab			
Course Code:	**CS585**	**Credits:**	**2**
No. of Lectures (Hrs/Week):	**3**		
Total No. of Lectures:	**10**	**End Sem Exam Hours:**	**2**

1. Write a program for depth first search.
2. Write a program for best first search.
3. Write a program to generate the output for a* algorithm.
4. Write a lisp program to solve water jug problem using heuristic function.
5. Write a program to show the tic tac toe game for 0 and x.
6. Write a program for expert system by using forward chaining.
7. Write a program for expert system by using backward chaining.
8. Write a program for branch and bound searching technique.
9. Write a program for travelling-salesman problem.
10. Write a program for tower of hanoi problem.

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ADVANCED SOFTWARE ENGINEERING			
Course Code:	**CS532**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I SOFTWARE ENGINEERING

Introduction to software engineering, Software Development Life Cycle, software process models, requirement analysis and design, software design process, coding, testing, implementation and maintenance, software metrics, agile software engineering, clean room software engineering, empirical software engineering.

UNIT II OBJECT-ORIENTED SOFTWARE ENGINEERING

OOSE, object-orientation paradigm, object-oriented programming languages, object modeling languages, object-oriented analysis, object-oriented design: design stereotypes and objects, design patterns; software design using patterns and framework, object-oriented case tools.

UNIT III COMPONENT-BASED SOFTWARE ENGINEERING

Component-Based Software Engineering (CBSE), CBSE and software reuse, CBSE vs. object-oriented software engineering, CBSE processes, domain engineering, component engineering, component-based software development life cycle, component vs. object, component-oriented programming, component-oriented programming vs. object-oriented programming, overview of component-based technology.

UNIT IV ASPECT-ORIENTED SOFTWARE ENGINEERING

Software engineering with aspects, aspects, aspect vs. object, aspect vs. component, join points and pointcuts, separation of concerns, crosscutting concerns, problems caused by scattering and tangling, system development, concepts of Aspect Oriented Programming, comparison to other programming paradigms.

UNIT V SOFTWARE RE-ENGINEERING AND REVERSE ENGINEERING

Re-engineering concept and approaches, redevelopment vs reengineering, reengineering process, reverse engineering, levels of reverse engineering: re-documentation, design recovery, specification recovery, conditions for reverse engineering, supporting techniques: forward engineering, restructuring, re-engineering, benefits of reverse engineering, software re-engineering patterns, patterns based software re-engineering, software re-engineering techniques.

Text Books:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, New Delhi 1997.
2. Ian Sommerville, Software Engineering, Pearson Education, 2009.

Reference Books:

3. Pressman Roger S., Software Engineering: Practitioner's Approach, McGraw-Hill Inc., 2004.
4. N. S. Gill, Software Engineering: Software Reliability, Testing and Quality Assurance, Khanna Book Publishing Co (P) Ltd., New Delhi, 2002.
5. J. Rumbaugh, M. Blaha, W. Premerlani, Object-Oriented Modeling and Design, PHI, 1991.
6. George T. Heineman, William T. Councill, Component-Based Software Engineering: Putting the Pieces Together, Addision Wesley, 2001.
7. Robert E. Filman, Tzilla Elrad, Siobhán Clarke, Mehmet Aksit, Aspect-Oriented Software Development Addison-Wesley Professional, 2004.

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Advanced Data Structure & Algorithm Design			
Course Code:	**CS574**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I INTRODUCTION

Review of Basic Concepts: Abstract data types, Data structures, Algorithms, Big Oh, Small Oh, Omega and Theta notations, Solving recurrence equations, Master theorems, Generating function techniques, Constructive induction

UNIT II ADVANCE DATA STRUCTURE

Advanced Search Structures for Dictionary ADT: Splay trees, Amortized analysis, 2-3 trees, 2-3-4 trees, Red-black trees, Randomized structures, Skip lists, Treaps, Universal hash functions, Disjoint sets / union-find

UNIT III

Advanced Structures for Priority Queues and Their Extensions: Binomial heaps, Leftist heaps, skewed heaps, Fibonacci heaps and its amortized analysis, Applications to minimum spanning tree algorithms, Randomized algorithms, Approximation algorithms, NP-Completeness

UNIT IVALGORITHM TECHNIQUE

Divide and Conquer, Searching and Traversal techniques: General method, merge sort, quick sort, Efficient non recursive tree traversal algorithms, DFS, BFS of Graphs, AND/OR graphs, game tree, Bi-connected components, Backtracking

UNIT V SELECTED TOPIC

Greedy method and Dynamic programming : General method (Greedy), Minimum cost spanning trees, Job sequencing with deadlines, General method (Dynamic Programming), Optimal binary search trees, 0/1 knapsack problem, Travelling sales person problem.

REFERENCES:

1. Jeff Edmonds, "How to Think about Algorithms", Cambridge University Press, 2008

2. Thomsas H. Coremen et.al "Introduction to Algorithms" Third Edition, PHI, 2009

3. Parag Himanshu Dave " Design and Analysis of Algorithm" First Edition, Pearson Education, 2008

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Advanced Data Structure & Algorithm Design lab			
Course Code:	**CS574**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**15**	**End Sem Exam Hours:**	**3**

1. Implementation of graph search algorithms.
2. Implementation and application of network flow and linear programming problems.
3. Implementation of algorithms using the hill climbing and dynamic programming design techniques.
4. Implementation of recursive backtracking algorithms.
5. Implementation of randomized algorithms.
6. Implementation of various locking and synchronization mechanisms for concurrent linked lists, concurrent queues, and concurrent stacks.
7. Developing applications involving concurrency.
8. Implement and apply concurrent linked lists, stacks, and queues.

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ADVANCED OPERATING SYSTEM			
Course Code:	**CS576**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT 1:
Introduction To Operating Systems, Types Of Operating Systems, Operating System Structures. Operating System Services, System Calls, Virtual Machines, Operating System Design And Implementation.

UNIT II
Process Management: Process Concepts, Operations On Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple -Processor Scheduling.Thread Scheduling. Process Synchronization & Deadlocks: The Critical Section Problem, Semaphores, And Classical Problems Of Synchronization, Critical Regions, Monitors, Deadlocks,-System Model, Deadlocks Characterization, Methods For Handling Deadlocks, Deadlock- Prevention, Avoidance, Detection,& Recovery from Deadlocks.

UNIT III
Memory Management & File System Implementation: Logical Versus Physical Address Space, Paging And Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing, File System Implementation -Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers

UNIT IV
Distributed Operating Systems: Distributed System Goals, Types Of Distributed Systems, Styles &Architecture Of Distributed Systems, Threads, Virtualization, Clients, Servers, Code Migration, and Communication in Distributed Systems.

UNIT V
Distributed Systems & Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Data-Centric Consistency Models, Client-Centric Consistency Models, Consistency Protocols. Fault Tolerance, Security: Introduction To Fault Tolerance, Process Resilience,, Reliable Client-Server Communication, Reliable Group Communication, Distributed Commit, Recovery, Secure Channels, Access Control, Security Management. Case Study: Over View Of UNIX, LINUX, Windows NT , Android And IOS Operating systems

Text Books:

1) Silberschatz & Galvin, 'Operating System Concepts', Wiley.
2) "DISTRIBUTED SYSTEMS", Second edition, Andrew S.Tanenbaum, Maarten Van teen.

References:

1) William Stallings-"Operating Systems"- 5th Edition - PHI
2) Charles Crowley, 'Operating Systems: A Design-Oriented Approach', Tata Hill Co.,1998 edition.
3) Andrew S.Tanenbaum, 'Modern Operating Systems', 2nd edition, 1995, PHI.
4) Advanced Concepts in Operating systems.Distributed, Database and Multiprocessor operating systems, Mukesh singhal, Niranjan G.Shivaratri, Tata McGraw Hill Edition.
5) Dhamdhere, "Operating Systems - A concept based approach", 2nd Edition, TMH, 2006.
6) Daniel P Bovet and Marco Cesati, "Understanding the Linux Kernel ", 3rd Edition,' Reilly, 2005.
7) Pradeep K. Sinha, "Distributed Operating Systems - Concepts and Design", 2nd Edition, IEEE 1997.

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WIRELESS MOBILE NETWORKS			
Course Code:	**CS596**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT -I:

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT II:

Wireless propagation channels, propagation mechanisms (qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models.

UNIT –III:

Wireless Technology, wireless advantages and disadvantages, Wireless Data Transmission, understanding radio frequency communication. How antenna works.

UNIT –IV:

Low rate wireless personal area networks, high rate wireless personal area networks, low speed wireless LANs, High Speed wireless WLANs, Wireless MANs.

UNIT -V:

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE.
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – Upen Dalal, Oxford Univ. Press.
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

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Computer Security			
Course Code:	**CS 695**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT 1

Introduction: Information security, threats, vulnerabilities, controls; risk; Security requirements: confidentiality; integrity; availability; authentication; authorization; access control, security policies, security mechanisms; assurance; prevention, detection, deterrence, Physical security.

UNIT2.

Basic cryptography: Basic cryptographic terms, Symmetric and Asymmetric crypto methods, security attacks, Malicious code: viruses, Trojan horses, worms, Program flaws: buffer overflows, time-of-check to time-of-use flaws, incomplete mediation, Defenses; Software development controls; testing techniques.

UNIT 3.

Security in Operating Systems: Memory, time, file, object protection requirements and techniques, Protection in contemporary operating systems, Identification, and Authorization Identification and, Identification goals, Authentication requirements, Human authentication, Machine authentication, OS integrity checks, Anti-virus software

UNIT 4.

Trusted operating systems and Database management systems security: Assurance; trust, Design principles, Evaluation criteria, Evaluation process, Database management systems security basics; integrity and secrecy, Inference control, multilevel databases

UNIT 5.

Wireless and Network security: Introduction to network security issues and techniques: eavesdropping, spoofing, modification, denial of service attacks, firewalls and its types, virtual private networks, Intrusion detection and prevention, Security issues in wireless network.

Reference books:

1. Charles P. Pfleeger and Shari L. Pfleeger. Security in Computing (3rd edition). Prentice-Hall. 2003. ISBN: 0-13-035548-8.
2. Information Security Principles & Practices by Merkow
3. Information Security Fundamentals by Thomas R. Peltier, Justin Peltier, & John Blackley
4. Cryptography and Network Security Principles and Practices, Fourth Edition by William Stallings

Ad Hoc Networks			
Course Code:	**CS 596**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT-I:
Wireless LANS and PANS: Introduction, Fundamentals of WLANS, IEEE 802.11 Standard, HIPERLAN Standard, Bluetooth, Home RF. Wireless Internet: Wireless Internet, Mobile IP, TCP in Wireless Domain, WAP, Optimizing Web Over Wireless.

UNIT-II:
AD HOC Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, AD Hoc Wireless Internet. MAC Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT -III:
Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols. Transport Layer and Security Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks, Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

UNIT –IV:
Quality of Service: Introduction, Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad Hoc Wireless Networks. Energy Management: Introduction, Need for Energy Management in Ad Hoc Wireless Networks, Classification of Ad Hoc Wireless Networks, Battery Management Schemes, Transmission Power Management Schemes, System Power Management Schemes.

UNIT –V:
Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

TEXT BOOKS:
1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press

REFERENCE BOOKS:
1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.

2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer

EMBEDDED LINUX			
Course Code:	**CS 598**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT 1

Introduction: Embedded Linux, Real Time Linux,Types of Embedded Linux systems, Advantages of Linux OS, Using distributions, Examples of Embedded Linux systems- system architecture, Types of host/target architectures for the development of Embedded Linux Systems, Debug setups, Boot Configurations, Processor architectures supported by Linux

UNIT2

Cross platform Development toolchain: GNU tool chain basics, Kernel Headers Setup, Binutils setup, Bootstrap Compiler Setup, Library Setup, Full Compiler Setup, Using the tool chain, C library alternatives, JAVA, Perl, Python, Ada, IDEs , Terminal Emulators

UNIT3

Kernel and Root File System Kernel Considerations- selection, configuration , Compiling and Installing the kernel Root File System Structure, Librariries, Kernel Modules, Kernel Images, Device Files, Main System Applications, Custom Applications, System Initialization

UNIT4

Storage Device Manipulation MTD-Supported Devices,Disk Devices, Swapping **Root FilesystemSetup:**Filesystem Types for Embedded Devices, Writing a Filesystem Image to Flash using an NFS-Mounted Root Filesystem, Placing a Disk Filesystem on a RAM Disk, Rootfs and Initramfs, Choosing a Filesystem's Type and Layout, Handling Software Upgrades **Setting Up the Bootloader**Embedded Bootloaders, Server Setup for Network Boot, Using the U-Boot Bootloader

UNIT 5

Device Drivers: Introduction, Building and running modules, Char Drivers,Allocating memory, USB Drivers, Device Model, Memory mapping and DMA, Block Drivers, TTY Drivers

Text Books:

1. Building Embedded Linux Systems **,** Karim Yaghmour, JonJasonBrittain and Ian F. Darwin Masters, Gilad Ben-Yossef, and Philippe Gerum**,** O'Reilly

2. Linux Device Drivers, Alessandro Rubini, Jonathan Corbet, O'Reilly

Reference:

1. Embedded Linux Primer A Practical Real – World Approach, Christopher Hallinan, Prentice Hall

2. Embedded Linux System Design and Development, P Raghavan, Amol Lad, SriramNeelakandan, Auerbach Publications

3. Essential Linux Device Drivers, Alan Cox, Sreekrishnan,Venkateswaran, Pretice Hall

4. Embedded Linux Hardware, Software and Interfacing Craig Hollabaugh, Pearson Education

Analytical Models for Computing Systems			
Course Code:	**CS 680**	**Credits:**	**3**
No. of Lectures (Hrs/Week):	**3**	**Mid Sem Exam Hours:**	**2**
Total No. of Lectures:	**45**	**End Sem Exam Hours:**	**3**

UNIT I

Need Computer Systems, Overview of Analytical Models, Introduction to Queueing, Probability Review, Generating Random Variables for Simulation, Sample Paths, Little's Law and other Operational Laws, Modification for Closed Systems.

UNIT II

Discrete-Time Markov Chains, Ergodicity Theory, Real World Examples,Google, Aloha,Transition to Continuous-Time Markov Chain, M/M/1 and PASTA.

UNIT III

Server Farms: M/M/k and M/M/k/k, Capacity Provisioning for Server Farms, Time Reversibility and Burke's Theorem, Networks of Queues and Jackson Product Form, Classed and Closed Networks of Queues.

UNIT IV

Case Study of Real-world Workloads, Phase-Type Distributions and Matrix-Alalytic Methods, Networks with Time-Sharing Servers, M/G/1 Queue and the Inspection Paradox, Task Assignment Policies for Server Farms.

UNIT V

Performance Metrics, Scheduling Non-Preemptive and Preemptive Non-Size-Based Policies . Scheduling Non-Preemptive and Preemptive Size-Based Policies, Scheduling SRPT and Fairness.

REFERENCES:

1. MorHarchol - Balter, "Performance Modeling and Design of Computer Systems – Queueing Theory in Action", Cambridge University Press, 2013.
2. Raj Jain, "The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation and Modeling", Wiley-Interscience, 1991.
3. LievenEeckhout, "Computer Architecture Performance Evaluation Methods", Morgan and Claypool Publishers, 2010.
4. Paul J. Fortier and Howard E. Michel, "Computer Systems Performance Evaluation and Prediction", Elsevier, 2003.