M.Tech. Computer Networks & Information Security (1ST SEMESTER)
TOTAL CONTACT HRS. = 24, TOTAL CREDITS = 22

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCSE2-101	Advanced Data Structures and Algorithm	**3**	**1**	**0**	**40**	**60**	**100**	**4**
MREM0-101	Research Methodology	**4**	**0**	**0**	**40**	**60**	**100**	**4**
MCSE2-103	Soft Computing	**3**	**1**	**0**	**40**	**60**	**100**	**4**
Departmental Elective-I		**3**	**1**	**0**	**40**	**60**	**100**	**4**
MCSE2-156	Agile Software Development							
MCSE2-157	Information Security							
MCSE2-158	Cloud Computing							
MCSE2-159	Internet Technology							
Departmental Elective-II		**3**	**1**	**0**	**40**	**60**	**100**	**4**
MCSE2-160	Advanced Computer Networks							
MCSE2-161	Advanced Operating System							
MCSE2-162	Wireless sensor network							
MCSE2-163	Mobile networking							
MCSE2-104	**Practical lab I**	**0**	**0**	**4**	**60**	**40**	**100**	**2**
Total 5 Theory & 1 Lab. Courses		**16**	**4**	**04**	**260**	**340**	**600**	**22**

M. Tech. Computer Networks & Information Security (2nd SEMESTER)
TOTAL CONTACT HRS. = 24, TOTAL CREDITS = 22

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MCSE2-205	Graph Theory	**3**	**1**	**0**	**40**	**60**	**100**	**4**
MCSE2-206	Cryptography & Network Security	**3**	**1**	**0**	**40**	**60**	**100**	**4**
Departmental Elective-III		**3**	**1**	**0**	**40**	**60**	**100**	**4**
MCSE2-264	Information Retrieval							
MCSE2-265	Ethical hacking							
MCSE2-266	Distributed Systems							
MCSE2-267	Grid Computing							
Departmental Elective-IV		**3**	**1**	**0**	**40**	**60**	**100**	**4**
MCSE2-268	Network Programming							
MCSE2-269	Linux Programming							
MCSE2-270	Network Performance Evaluation							
MCSE2-271	Open Source Technology							
Open Elective I		**3**	**1**	**0**	**40**	**60**	**100**	**4**
MCSE1-207	Practical Lab II	**0**	**0**	**4**	**60**	**40**	**100**	**2**
Total 5 Theory & 1 Lab. Courses		**15**	**5**	**04**	**260**	**340**	**600**	**22**

Total Marks = 600 + 600 = 1200
Total Credits = 22 + 22= 44

OPEN ELECTIVES OFFERED BY M.Tech. CSE MRSPTU, BATHINDA		
S.No.	**Course Code**	**Course**
OPEN ELECTIVE-I		
91	MCSE0-F91	Soft Computing
92	MCSE0-F92	Big Data Analytics Concepts
93	MCSE0-F93	Management Information System
94	MCSE0-F94	Advanced Data Structures

F means that this Course can be opted by students of different semesters.

ADVANCED DATA STRUCTURES AND ALGORITHMS

Subject Code: MCSE1-101, MCSE2-101, MCSE3-101, MCSE4-101	**L T P C** **3 1 0 4**	**Duration – 45 hrs**

COURSE OBJECTIVES

To learn the advanced concepts of data structure and algorithms and its implementation. The course has the main ingredients required for a computer science graduate and has all the necessary topics for assessment of data structures and algorithms.

COURSE OUTCOMES

CO1: Ability to apply and implement various data structures to algorithms and to solve problems.

CO2: Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.

CO3: Ability to apply various traversing, finding shortest path and text pattern matching algorithm.

CO4: Know the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems.

COURSE CONTENT

UNIT I

Introduction to Basics: Significance and need of various data structures and algorithms, Arrays, Linked lists, Stacks, Queues, Priority queues, Heaps; Strategies for choosing the appropriate data structures. (6 hrs)

Advanced Data Structures: Binary Search Tree**,** AVL Trees, Red-Black Trees, Splay Trees, B-trees, Fibonacci heaps, Data Structures for Disjoint Sets, Augmented Data Structures. (6 hrs)

UNIT II

Algorithms Complexity and Analysis: Probabilistic Analysis, Amortized Analysis, Competitive Analysis, Internal and External Sorting algorithms: Quick Sort, Heap Sort, Merge Sort, Counting Sort, Radix Sort. (10 hrs)

UNIT III

Graphs & Algorithms: Representation, Type of Graphs, Paths and Circuits: Euler Graphs, Hamiltonian Paths & Circuits; Cut-sets, Connectivity and Separability, Planar Graphs, Isomorphism, Graph Coloring, Covering and Partitioning, bridges , Depth- and breadth-first traversals, Minimum Spanning Tree: Prim's and Kruskal's algorithms, Shortest-path Algorithms: Dijkstra's and Floyd's algorithm, Topological sort, Max flow: Ford-Fulkerson algorithm, max flow – min cut. (11 hrs)

String Matching Algorithms: Suffix arrays, Suffix trees, Brute Force, Rabin-Karp, Knuth-Morris-Pratt, Boyer-Moore algorithm. (4 hrs)

UNIT IV

Approximation Algorithms: Need of approximation algorithms: Introduction to P, NP, NP-Hard and NP-Complete; Deterministic, non-Deterministic Polynomial time algorithms; Knapsack, TSP, Set Cover, Open Problems. (5 hrs)

Randomized Algorithms: Introduction, Type of Randomized Algorithms, 2-SAT; Game Theoretic Techniques, Random Walks. (3 hrs)

RECOMMENDED BOOKS:

1. E. Horowitz, S. Sahni and Dinesh Mehta, 'Fundamentals of Data Structures in C++', Galgotia, **1999**.
2. Thomas H. Corman, Charles E. Leiserson, Ronald L. Rivest, 'Introduction to Algorithms', PHI, 3rd Edn., **2009**.
3. Adam Drozdex, 'Data Structures and Algorithms in C++', 2nd Edn., Thomson Learning – Vikas Publishing House, **2001**.
4. G. Brassard and P. Bratley, 'Algorithmics: Theory and Practice', Prentice –Hall, **1988**.

RESEARCH METHODOLOGY

Subject Code – MREM0-101 **L T P C** **Duration – 45 Hours**
4 0 0 4

UNIT–I (11 Hrs)

Introduction to Research: Meaning, Definition, Objective and Process
Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental
Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature
Design of Experiment: Basic Principal of Experimental Design, Randomized Block, Completely Randomized Block, Latin Square, Factorial Design.
Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal

UNIT–II (10 Hrs)

Sources of Data: Primary and Secondary, Validation of Data
Data Collection Methods: Questionnaire Designing, Construction
Sampling Design & Techniques – Probability Sampling and Non Probability Sampling
Scaling Techniques: Meaning & Types
Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability
Validity: Content Validity, Criterion Related Validity and Construct Validity

UNIT–III (13 Hrs)

Data Process Operations: Editing, Sorting, Coding, Classification and Tabulation
Analysis of Data: Statistical Measure and Their Significance, Central Tendency, Dispersion, Correlation: Linear and Partial, Regression: Simple and Multiple Regression, Skewness, Time series Analysis, Index Number
Testing of Hypothesis: T-test, Z- test, Chi Square, F-test, ANOVA

UNIT – IV (11 Hrs)

Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, Multi-Dimensional Scaling
Report Writing: Essentials of Report Writing, Report Format
Statistical Software: Application of Statistical Software like SPSS, MS Excel, Mini Tab or MATLAB Software in Data Analysis
**Each Student has to Prepare Mini Research Project on Topic/ Area of their Choice and Make Presentation. The Report Should Consists of Applications of Tests and Techniques Mentioned in The Above UNITs*

Recommended Books

1. R.I. Levin and D.S. Rubin, 'Statistics for Management', 7th Edn., Pearson Education, New Delhi.
2. N.K. Malhotra, 'Marketing Research–An Applied Orientation', 4th Edn., Pearson Education, New Delhi.
3. Donald Cooper, 'Business Research Methods', Tata McGraw Hill, New Delhi.
4. Sadhu Singh, 'Research Methodology in Social Sciences', Himalaya Publishers.
5. Darren George & Paul Mallery, 'SPSS for Windows Step by Step', Pearson Education, New Delhi.
6. C.R. Kothari, 'Research Methodology Methods & Techniques', 2nd Edn., New Age International Publishers.

SOFT COMPUTING

Subject Code: MCSE1-103, MCSE2-103, MCSE3-103, MCSE4-103	**L T P C** **3 1 0 4**	**Duration – 45 hrs**

COURSE OBJECTIVES:

The objective of this course is to teach basic neural networks, fuzzy systems, Genetic Algorithms and optimization algorithms concepts and their relations**.**

COURSE OUTCOMES:

CO1: Able to comprehend techniques and applications of Soft Computing in real world problems.

CO2: Able to follow fuzzy logic methodology and design fuzzy systems for various applications.

CO3: Able to design feed forward Artificial Neural Networks (ANN) and implement various methods of supervised learning.

CO4: Able to design feedback Artificial Neural Networks (ANN) and implement various methods of unsupervised learning

CO5: Able to appreciate the methodology of GA and its implementation in various applications.

COURSE CONTENT:

UNIT I

Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Fuzzy Logic: Fuzzy set versus crisp set, basic concepts of fuzzy sets, membership functions, basic operations on fuzzy sets and its properties. Fuzzy relations versus Crisp relation,

Fuzzy rule base system: Fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, Fuzzy Inference Systems (FIS), Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Fuzzification and Defuzzification, fuzzy decision making & Applications of fuzzy logic.

UNIT II

Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN and its applications. Neural Network architecture: Single layer and multilayer feed forward networks and recurrent networks. Learning rules and equations: Perceptron, Hebb's,

Delta, winner take all and out-star learning rules. Supervised Learning Network: Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, Back Propagation Network, Associative memory networks, Unsupervised Learning Networks: Competitive networks, Adaptive Resonance Theory, Kohnen Self Organizing Map

UNIT III

Genetic algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: selection operator, cross over, mutation operator, Stopping Condition and GA flow, Constraints in GA, Applications of GA, Classification of GA.

UNIT IV

Hybrid Soft Computing Techniques: An Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid systems, Genetic fuzzy Hybrid and fuzzy genetic hybrid systems

RECOMMENDED BOOKS:

1. S. Rajasekaran & G.A. Vijayalakshmi Pai, 'Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications', 1st Edn., PHI Publication.
2. S.N. Sivanandam & S.N. Deepa, 'Principles of Soft Computing', Wiley Publications, 2nd Edn., **2008.**
3. Michael Negnevitsky, 'Artificial Intelligence', Pearson Education, New Delhi, **2008**.
4. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Wiley, **2010.**
5. Bose, 'Neural Network fundamental with Graph, Algo. & Appl,', TMH, **2004.**
6. Kosko: 'Neural Network & Fuzzy System', 1st Edn., PHI Publication, **2009.**
7. Klir &Yuan, 'Fuzzy Sets & Fuzzy Logic: Theory & Applications', PHI Pub., **1995**.
8. Hagen, 'Neural Network Design', 2nd Edn., Cengage Learning, **2008.**

AGILE SOFTWARE DEVELOPMENT APPROACHES

Subject Code: MCSE1-156, MCSE2-156 MCSE4-156 MCSE3-205 | **L T P C 3 1 0 4** | **Duration – 45 hrs**

COURSE OBJECTIVES:

This course makes student learn the fundamental principles and practices associated with each of the agile development methods. To apply the principles and practices of agile software development on a project of interest and relevance to the student.

COURSE OUTCOMES:

CO1: To learn the basics concepts of Agile software and their principles design

CO2: To explain different agile development method, project tools requirement, risk and measurements related with different development methods.

CO3: To understand the overview of Agile methods, strategies, requirements and testing.

CO4: Describe and explain agile measurement, configuration and risk management. Principles of Astern and tools.

COURSE CONTENT:

UNIT I

Introduction: Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges.

Agile and Its Significance: Agile development, Classification of methods, the agile manifesto and principles, Practices of XP, Scrum Practices, working and need of Scrum, advanced Scrum Applications, Scrum and the Organization.

UNIT II

Agile Project Management: Embrace communication and feedback, Simple practices and project tools, Empirical Vs defined and prescriptive process – Principle-based versus Rule-Based – Sustainable discipline: The human touch – Team as a complex adaptive system – Agile hype – Specific agile methods. Quality, Risk, Metrics and Measurements, the facts of change on software projects – Key motivations for iterative development – Meeting the requirements challenge iteratively – Problems with the waterfall. Research evidence – Early historical project evidence – Standards-Body evidence, Expert and thought leader evidence – A Business case for iterative development – The historical accident of waterfall validity.

UNIT III

Agile Methodology: Method overview – Lifecycle – Work products, Roles and Practices values – Common mistakes and misunderstandings – Sample projects – Process mixtures – Adoption strategies – Fact versus fantasy – Strengths versus "Other" history.

Agile Requirements: User Stories, Backlog Management. Agile Architecture: Feature-Driven Development. Agile Risk Management: Risk and Quality Assurance, Agile Tools.

UNIT IV

Agile Testing: Agile Testing Techniques, Test-Driven Development, User Acceptance Test.

Agile Review: Agile Metrics and Measurements, The Agile approach to estimating and project variables, Agile Measurement, Agile Control: the 7 control parameters. Agile approach to Risk, The Agile approach to Configuration Management, The Atern Principles, Atern Philosophy, the rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools.

RECOMMENDED BOOKS:

1. Elisabeth Hendrickson, 'Agile Testing', Quality Tree Software Inc., **2008**.
2. Craig Larman, 'Agile and Iterative Development-A Manager's Guide', Pearson Education, **2004**.
3. Robert C. Martin, 'Agile Software Development, Principles, Patterns, and Practices', (Alan Apt Series), **2011**.
4. Alistair, 'Agile Software Development Series', Cockburn, **2001**.
5. 'Succeeding with Agile: Software Development Using Scrum', Pearson, **2010.**

INFORMATION SECURITY

Subject Code: MCSE1-162	**L T P C**	**Duration – 45 hrs**
MCSE2-157	**3 1 0 4**	
MCSE4-157		

COURSE OBJECTIVES:

It will help the students to understand the various concepts related to network security. The students will learn various techniques/algorithms that can be used to achieve security. They will also learn the security basics for wireless networks.

COURSE OUTCOMES:

CO1: To understand the concepts of network security
CO2: To learn the techniques for authentication and authorization
CO3: To be able to understand the confidentiality requirement and the ways to achieve it.
CO4: To know about wireless network security.

COURSE CONTENT:

UNIT I

Overview: Computer Security Concepts, Challenges, Requirements, OSI security Architecture: services, mechanism and attacks, network security model, Classical encryption techniques, latest security trends, need of security strategy,

UNIT II

Authentication: Message authentication, message authentication techniques: Hash, MAC, digital Signatures, User Authentication: one-way authentication, mutual authentication, Password-based authentication, token based authentication, Biometric authentication, Remote User authentication.

Authorization: Identification, authorization, Access Control: Principles, Access Rights, Discretionary Access Control, Role Based Access Control, Unix File Access Control, Role Based Access Control Internet Authentication Applications: Kerberos, X.509, PKI, Federated Identity Management.

UNIT III

Confidentiality: Encryption, attacks, Symmetric Encryption: DES, AES, Asymmetric Encryption: RSA, Key Distribution scenario, Email security: S/ MIME, PGP.

Wireless network security: IEEE 802.11 wireless LAN, 802.11i wireless LAN security, Wireless Application Protocol, Wireless transport layer security, WAP End to End security.

UNIT IV

Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security

RECOMMENDED BOOKS:

1. William Stalling & Lawrie Brown, 'Computer Security: Principles and Practice', Indian Edition, 2008, Pearson, **2010**.
2. Chuck Easttom, 'Computer Security Fundamentals', Pearson, **2011.**
3. M. Stamp, 'Information Security: Principles and Practice', 2nd Edn., Wiley, ISBN: 0470626399, **2011.**
4. M.E. Whitman and H.J. Mattord, 'Principles of Information Security', 4th Edn., Course Technology, ISBN: 1111138214, **2011**.
5. M. Bishop, 'Computer Security: Art and Science', Addison Wesley, ISBN: 0-201-44099-7, **2002.**

CLOUD COMPUTING

Subject Code: MCSE2-158 **L T P C** **Duration – 45 hrs**

3 1 0 4

COURSE OBJECTIVES:

To learn the advanced concepts of cloud infrastructure and services and its implementation for assessment of understanding the course by the students.

COURSE OUTCOMES:

CO1: Defining the cloud computing, types and cloud computing service (Saas, Iaas, Paas)

CO2: To familiarize with virtualization in cloud computing, data storage and develop application for cloud computing

CO3: Understanding the cloud computing services and deployment, management in cloud computing, implementing cloud based services and application requirements
CO4: To know and understand the testing in cloud computing. To learn the advanced topics in cloud computing like Big data and IoT.

COURSE CONTENT

UNIT I

Introduction: Cloud Computing definition, Cloud Types- Private, Public and Hybrid cloud. Cloud Services: Software as a Service (SaaS)- Understanding the Multitenant Nature of SaaS Solutions, Understanding SOA. Platform as a Service (PaaS)-IT Evolution Leading to the Cloud, Pros and Cons of PaaS Solutions. Infrastructure as a Service (IaaS)- Understanding IaaS, Improving Performance through Load Balancing, System and Storage Redundancy, Utilizing Cloud-Based NAS Devices, Advantages, Server Types. Benefits and challenges of cloud computing.

UNIT II

Virtualization: Definition, Type of Virtualization, Benefits, Limitations, Virtualization and Cloud, Virtual Appliance, Load Balancing and Virtualization, Hypervisors, Machine Imaging.
Cloud based Data Storage: Introduction to Map Reduce for Simplified data processing on Large clusters, Design of data applications based on Map Reduce in Apache Hadoop, Task Partitioning, Data partitioning, Data Synchronization, Distributed File system, Data Replication.

UNIT III

Cloud Services: Introduction, Contrast traditional software development and development for the cloud. Technologies and the processes required when deploying web services; deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, Public vs Private cloud apps.
Management of Cloud Services: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics-Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization application requirement, economic constraints and business needs (e.g Amazon, Microsoft and Google,Salesforce.com, Ubuntu and Red hat).

UNIT IV

Open Source Cloud Computing and Testing: Open Stack, Open Nebula-underlying technologies, Cloud Monitoring-Ganglia; Physical and virtual machine memory, CPU management and abstraction techniques using a hypervisor. Software Testing in the Cloud - SMART-T- Migrating Testing to the Cloud, Hadoop Unit- Test Execution in the Cloud.
Advance Topics: Mobile Cloud Computing, Big-Data and Internet of Things (IoT): Definition of Big Data, Structured and Unstructured Data, V's of Big-Data, Hadoop, Definition of IoT, Characteristics of IoT, Combining Big-Data, IoT and Cloud Computing.

RECOMMENDED BOOKS:

1. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 'Cloud Computing: A Practical Approach', The McGraw-Hill, **2010**.
2. Kris Jamsa, 'Cloud Computing: SaaS, PaaS, IaaS, Virtualization and More', **2012**.
3. Gautam Shroff, 'Enterprise Cloud Computing Technology Architecture Applications', 1st Edn., Cambridge University Press, **2010**.
4. Dimitris N. Chorafas, 'Cloud Computing Strategies', 1st Edn., CRC Press, **2010.**
5. Kevin Jackson, Cody Bunch, 'Open Stack Cloud Computing Cookbook', 2nd Edn., Packt. Publishing, **2013**.

INTERNET TECHNOLOGY

Subject Code: MCSE2-159 **L T P C** **Duration – 45 hrs**
3 1 0 4

COURSE OBJECTIVES:
At the end of this course students will learn the fundamentals related to protocols and services implemented in communication networks.

COURSE OUTCOMES:
CO1: To understand the various technologies used in modern computer network.
CO2: To learn the management of quality of service in multimedia networks.
CO3: To outline the various areas of network security.
CO4: To understand the implementation of networking protocols in mobile networks

COURSE CONTENT

UNIT-I

Computer Networks and the Internet: Evolution of Internet, Internet services, Internet protocols and standardization, TCP/IP, Review of Network technologies, Addressing schemes, Interconnection through IP Gateways or routers, Internet and Intranet. Principles of application-layer protocols, HTTP, FTP, DHCP, TELNET, e-mail, DNS, socket programming with TCP/UDP, web servers, web pages design using HTML and XML.

UNIT II

Multimedia Networking: Applications: streaming stored audio and video, internet telephony, RTP, scheduling and policing mechanisms, integrated services, RSVP, differentiated services: network management, the internet network management framework.

UNIT-III

Network Security: E-mail security, privacy, SMIME, IP Security: overview, architecture, authentication, header and payload, combining security associations, key management. Web security: SSL, SET. Systems Security: intruders and viruses, firewalls: design, trusted systems.

UNIT-IV

Mobile Internet - mobile network layer, mobile IP, dynamic host configuration protocol, ad hoc networks, mobile transport layer, implications of TCP on mobility, indirect TCP, snooping TCP, mobile TCP, transmission, selective retransmission, transaction-oriented TCP, support for mobility, file systems, WAP protocols, WML, WML script, wireless telephony applications**.**

RECOMMENDED BOOKS:

1. J.F. Kurose & K.W. Ross, 'Computer Networking: A Top-Down Approach Featuring the Internet', Modules I & II, Addison Wesley, **2006.**
2. W. Stallings, 'Cryptography and Network Security Principles and Practice', Module III, Pearson Education Asia, **2005**.
3. J. Schiller, 'Mobile Communications', Module IV, Addison Wesley, **2005**.
4. H.M. Deitel, P.J. Deitel & T.R. Nieto, 'Internet and World Wide Web: How to Program', Pearson Education, **2005.**
5. R. Greenlaw & E. Hepp, 'In-line / On-line: Fundamentals of the Internet and the World
6. Wide Web', Tata McGraw Hill, **2004**.
7. V. Sharma & R. Sharma, 'Developing e-Commerce Sites: An Integrated Approach', Addison Wesley, **1999**.
8. S. Singhal et. al, 'The Wireless Application Protocol', Pearson Education Asia, **2000**.

9. M. Goncalves, 'Firewalls: A Complete Guide', Tata McGraw Hill, **2001**.
10. Douglas E. Comer, 'Computer Networks and Internets', 4th Edn., PE, **2008**

ADVANCED COMPUTER NETWORKS

Subject Code: MCSE2-160, MCSE1-206	**L T P C** **3 1 0 4**	**Duration – 45 hrs**

COURSE OBJECTIVES:

This course provides knowledge about computer network related hardware and software using a layered architecture. It is also offer good understanding of the concepts of network security, wireless, Adhoc and various emerging network technologies.

COURSE OUTCOMES:

CO1: Able to explain the Fundamentals of Computer Networks and their layered architecture. Also acquire knowledge about ATM Layered model and LAN Emulation.

CO2: Able to explain about various Transport and Application Layer Protocols. Also acquire knowledge about various congestion control mechanisms and network management.

CO3: Able to explain Features, advantages and applications of Adhoc Networks, Adhoc versus Cellular networks, Network architecture and Technologies. Evolution with the examples of wireless communication systems other techniques of Cellular Networks like 2G, 2.5G and 3G Technologies. Also able to explain wireless local loop (WLL), Wireless and local Area Networks (WLANs)

CO4: Able to define the Fundamentals of network security, various authentication protocols and E-mail Security.

COURSE CONTENT:

UNIT I

Computer networks and layered architecture, Asynchronous Transfer Mode- ATM layered model, switching and switching fabrics, network layer in ATM, QOS, LAN emulation.

UNIT II

Transport Layer-Elements of transport protocols; Internet transport protocols: TCP and UDP, TCP connection management, congestion control. Application Layer-Network application architectures: Client-server, P2P and hybrid; Application layer protocols: DNS, FTP, TFTP, TELNET, HTTP and WWW, SMTP and electronic mail; Network management and SNMP.

UNIT III

Adhoc and Cellular networks- Features, advantages and applications, Adhoc versus Cellular networks, Network architecture, Protocols: MAC protocols, Routing protocols, Technologies. Wireless Communication Systems- Evolution, examples of wireless communication systems, 2G Cellular networks, Evolution for 2.5G TDMA Standards, IS-95B for 2.5G CDMA. Wireless and Mobile Networks-Wireless links and network characteristics, wireless local loop (WLL), Local Multipoint Distribution System (LMDS), Wireless local Area Networks (WLANs), Bluetooth and Personal Area Networks.

UNIT IV

Introduction to Network Security- Cryptography, symmetric and public-key algorithms, digital signatures, communication security, and authentication protocols, E-mail security, PGP and PEM.

RECOMMENDED BOOKS:

1. B.A. Forouzan, 'Data Communication and Networking', 3rd Edn., Tata McGraw-Hill, 5th Edn., **2013**.
2. A.S. Tanenbaum, 'Computer Networks', 4th Edn., Pearson Education, **2002**.

3. W. Stallings, 'Network Security and Cryptography', 4th Edn., Prentice-Hall of India, 6th Edn., **2013**.
4. Theodore S. Rappaport, 'Wireless Communication: Principles and Practices', 2nd Edn., Pearson Education, **2001**.
5. D.E. Comer and R.E. Droms, 'Computer Networks and Internets', 4th Edn., Prentice-Hall, **2008**.
6. Sunil Kumar S. Manvi, Mahabaleshwar S. Kakkasageri, 'Wireless and Mobile Networks: Concepts and Protocols', Wiley India, **2010**.

ADVANCED OPERATING SYSTEM

Subject Code: MCSE1-161, MCSE4-162, MCSE2-161, MCSE3-161	**L T P C** **3 1 0 4**	**Duration – 45 hrs**

COURSE OBJECTIVES:

- To learn the fundamentals of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real time, Mobile operating systems.

COURSE OUTCOMES:

CO1 Discuss the various synchronization, scheduling and memory management issues
CO2 Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
CO3 Discuss the various resource management techniques for distributed systems
CO4 Identify the different features of real time and mobile operating systems

COURSE CONTENT

UNIT I

Fundamentals of Operating Systems: Strategies of operating system, Structures of operating system, overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling –Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

Distributed Operating Systems: Issues in Distributed Operating System – Architecture – Communication Primitives –Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT II

Distributed Resource Management: Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Non blocking Commit Protocol – Security and Protection.

UNIT III

Real Time And Mobile Operating Systems: Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems –Real Time Task Scheduling - Handling

Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads – Memory Management – File system,Networked file system

UNIT IV

CASE STUDIES: Linux System: Design Principles - Kernel Modules - Process Management Scheduling –Memory Management - Input-Output Management - File System – Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer -Services Layer - Core OS Layer – File System.

RECOMMENDED BOOKS:

1. Andrew S. Tanenbaum and Maarten van Steen. 'Distributed Systems: Principles and Paradigms', 2nd Edn., Prentice Hall, **2007**.
2. Mukesh Singhal and Niranjan G. Shivaratri, 'Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems', Tata McGraw-Hill, **2001**.
3. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 'Operating System Concepts', 7th Edn., John Wiley & Sons, **2004**.
4. Daniel P. Bovet and Marco Cesati, 'Understanding the Linux Kernel', 3rd Edn., O'Reilly, **2005**.
5. Rajib Mall, 'Real-Time Systems: Theory and Practice', Pearson Education India, **2006**.
6. Neil Smyth, 'iPhone iOS 4 Development Essentials – Xcode', 4th Edn., Payload media, **2011**.

WIRELESS SENSOR NETWORKS

Subject Code:CSE2-162 **L T P C** **Duration – 45 hrs**
3 1 0 4

COURSE OBJECTIVES: The objective of this course is to make the students to Understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems and provide a survey of sensor technology

COURSE OUTCOMES:

CO1: Able to explain about basic concepts of wireless sensor networks. Also acquire knowledge about architecture of sensor networks.
CO2: Acquire knowledge about MAC Protocols for Wireless Sensor Networks, and various routing protocols for networking sensors.
CO3: Able to explain about Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.
CO4: Acquire knowledge about Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

COURSE CONTENT

UNIT I

Overview of wireless sensor networks: Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks, Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT II

Networking sensors: Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management,

Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT III

Infrastructure establishment: Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT IV

Sensor network platforms and tools: Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

RECOMMENDED BOOKS:

1. Holger Karl & Andreas Willig, 'Protocols And Architectures for Wireless Sensor Networks'.
2. John Wiley, 2005.Feng Zhao & Leonidas J. Guibas, 'Wireless Sensor Networks- An Information Processing Approach', Elsevier, **2007**.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, 'Wireless Sensor Networks- Technology, Protocols and Applications', John Wiley, **2007**.
4. Anna Hac, 'Wireless Sensor Network Designs', John Wiley, **2003**.

MOBILE NETWORKING

Subject Code: MCSE2-163 **L T P C** **Duration – 45 hrs**
3 1 0 4

COURSE OBJECTIVES:

Students will familiarize themselves with mobile communication networks. They will gain insight into media access control mechanisms dedicated to wireless communication and have a thorough understanding of mechanisms based on the network and the transport layers, with a focus on ad hoc and mesh networks. Moreover, the students will acquire knowledge about the connections between the different protocol layers and will be able to apply the acquired knowledge on methodological analysis of real communication systems

COURSE OUTCOMES:

CO1: to familiarize with the basics of mobile networking
CO2: to understand the standards used in networks
CO3: to apprehend the concept of mobility at various layers
CO4: to evaluate the performance of mobile networks

COURSE CONTENT

UNIT-I

Introduction to mobile and wireless communications: Applications, history, market vision.
Overview of wireless transmission: frequencies & regulations, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, cellular systems.
Medium access control in the wireless domain: SDMA, FDMA, CDMA TDMA (fixed, Aloha, CSMA, DAMA, PRMA, MACA, collision avoidance, polling).

UNIT-II

Wireless local area networks: IEEE 802.11 standard including physical layer, MAC layer and access schemes (PCF and DCF), quality of service and power management.
Wireless metropolitan area networks: Wireless mesh networks, IEEE 802.16 standard including modes of operation, medium access control, quality of service and scheduling.

UNIT-III

Mobility at network layer: Concepts to support mobility on various layers, Mobile IPv4, Mobile IPv6, various enhancements of Mobile IP (fast-handover, hierarchical-MIP).
(Mobile)
Mobility at transport layer: Variants of TCP (indirect TCP, snoop TCP, mobile TCP, wireless TCP).

UNIT-IV

Ad hoc networks: Terminology, basics and applications, characteristics of ad hoc communication, ad hoc routing paradigms and protocols (AODV, DSR, LAR, OLSR).
Performance evaluation of mobile networks: Overview of performance evaluation, systematic approach / common mistakes and how to avoid them, experimental design and analysis.
Outlook: Applications for mobile networks, Wireless Sensor Networks and Participatory Sensing.

Recommended books

1. Jochen Schiller, 'Mobile Communications', 2nd Edn., **2003.**
2. Raj Jain, 'The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling', **1991.**
3. James F. Kurose, 'Computer Networking: A Top-Down Approach Featuring the Internet', 5th Edn., **2012**.

PRACTICAL LAB-I

Subject Code: MCSE2-104 | **L T P C** **0 0 4 2** | **Duration – 60 hrs**

COURSE CONTENT

- Practical's should be related to the core subjects of the same semester

GRAPH THEORY

Subject Code: MCSE2-205 | **L T P C** **3 1 0 4** | **Duration – 45 hrs**

COURSE OBJECTIVES

In computer science, graph theory is used extensively. While the course will cover all elementary concepts such as coloring, covering, planarity, connectivity and so on, it will also introduce the students to some advanced concepts.

COURSE OUTCOMES

CO1: Basic Ability to learn concepts of graph theory
CO2: Ability to learn and apply graph coloring and concepts of planar graph.
CO3: Ability to apply and implement tree structure, matching and connectivity
CO4: Know the optimized concepts of trees and matching.

COURSE CONTENT

UNIT I (10 hrs)

Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Paths, Cycles, and Trails, Vertex Degrees, Counting, Directed Graphs,

Euler Trails and Circuit, Planar Graphs, Hamilton Paths and Cycles, Graph Colouring, and Chromatic Polynomials

UNIT II (13 hrs)

Coloring of Graphs: Vertex Colorings and Upper Bounds, Structure of k-chromatic Graphs, Enumerative Aspects

Planar Graphs: Embedding and Euler's Formula, Characterization of Planar Graphs, Parameters of Planarity

Edges and Cycles: Line Graphs and Edge-Coloring, Hamiltonian Cycles, Planarity, Coloring, and Cycles

UNIT III (12 hrs)

Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes, Basic Properties, Spanning Trees and Enumeration,

Matchings and Factors: Matchings and Covers, Algorithms and Applications, Matchings in General Graphs

Connectivity and Paths: Cuts and Connectivity, k-connected Graphs, Network Flow Problems

UNIT IV (10 hrs)

Optimization and Matching: Dijkstra's Shortest Path Algorithm, Minimal Spanning Trees – The algorithms of Kruskal and Prim, Transport Networks – Max-flow, Min-cut Theorem, Matching Theory

RECOMMENDED BOOK:

1. Douglas B. West, 'Introduction to Graph Theory', 2nd Edn., Pearson Education, **2000**.
2. D.S. Chandrasekharaiah, 'Graph Theory and Combinatorics', Prism, **2005**.
3. Chartrand Zhang, 'Introduction to Graph Theory', 1st Edn., TMH, **2006**.
4. Richard A. Brualdi, 'Introductory Combinatorics', 4th Edn., Pearson Education, **2004**.
5. Geir Agnarsson & Raymond Geenlaw, 'Graph Theory', Pearson Education, **2007**.

CRYPTOGRAPHY & NETWORK SECURITY

Subject Code: MCSE2-206 **L T P C** **Duration – 45 hrs**
3 1 0 4

COURSE OBJECTIVES

The main objective of this course is to make student able to understand the basic concepts, services, threats and principles in network security, various security services and mechanisms in the network protocol stack.

COURSE OUTCOMES

After completion of the course, the student should be able to
CO1: Understand security trends.
CO2: Implement various cryptographic algorithms.
CO3: Explain the hash function.
CO4: Understand the network security and system level security used.

COURSE CONTENT

UNIT I (10 hrs)

Security trends, Attacks and services, Classical crypto systems, Different types of ciphers, LFSR sequences, Basic Number theory, Congruencies, Chinese Remainder theorem, Modular exponentiation, Fermat and Euler's theorem, Legendre and Jacobi symbols, Finite fields, continued fractions.

UNIT II (12 hrs)

Simple DES, Differential crypto analysis, DES – Modes of operation, Triple DES, AES, RC4, RSA, Attacks – Primality test – factoring.

UNIT III (11hrs)

Discrete Logarithms, Computing discrete logs, Diffie-Hellman key exchange, ElGamal Public key cryptosystems, Hash functions, Secure Hash, Birthday attacks, MD5, Digital signatures, RSA, ElGamal DSA.

UNIT IV (12 hrs)

Authentication applications – Kerberos, X.509, PKI – Electronic Mail security – PGP, S/MIME – IP security – Web Security – SSL, TLS, SET. Intruders, Malicious software, viruses and related threats, Firewalls, Security Standards.

RECOMMENDED BOOKS:

1. Wade Trappe, Lawrence C. Washington, 'Introduction to Cryptography with Coding Theory', 2nd Edn., Pearson, **2007**.
2. William Stallings, 'Cryptography and Network security Principles and Practices', 4th Edn., Pearson/PHI, **2006**.
3. W. Mao, 'Modern Cryptography – Theory and Practice', 2nd Edn., Pearson Education, **2007**.
4. Charles P. Pfleeger, Shari Lawrence Pfleeger, 'Security in Computing', 3rd Edn., Prentice Hall of India, **2006**.
5. Behrouz Forouzan, 'Cryptography & Network Security', 2nd Edn., McGraw-Hill, **2011**.

INFORMATION RETRIEVAL

Subject Code: MCSE2-264 **L T P C** **Duration – 45 hrs**
3 1 0 4

COURSE OBJECTIVES: To learn the underlying technologies of modern information retrieval system.

COURSE OUTCOMES:

CO1 Able to understand the basic concepts of modern information retrieval system.
CO2 Able to understand the search engine architecture.
CO3Able to learn the retrieval models and apply the algorithms of retrieval algorithms.
CO4 Able to evaluate the quality of retrieval system.

COURSE CONTENTS:

UNIT I (11 hrs)

Introduction: The nature of unstructured and semi-structured text, Boolean queries, World Wide Web, History of Hypertext, Hypertext systems, Problems due to Uniform accessibility, types of Hypertext data, Text and multimedia data indexing, PageRank, HITS, XML and Semantic web.

UNIT II (12 hrs)

Search engine architecture: the basic building blocks of a modern search engine system, including web crawler, basic text analysis techniques, inverted index, query processing, search result interface.

UNIT III (11 hrs)

Retrieval models: Boolean, vector space, probabilistic and language models, latent semantic indexing, ranking algorithm, Introduction to the most recent development of learning-based

ranking algorithms, i.e., learning-to-rank, Relevance feedback, query expansion, link analysis and search applications.

UNIT IV (11hrs)

Performance Evaluation: Evaluating search engines, User happiness, precision, recall, F-measure.

RECOMMENDED BOOKS:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, 'Introduction to Information Retrieval', 1st Edn., Cambridge University Press, **2008**.
2. Bruce Croft, Donald Metzler, and Trevor Strohman, 'Search Engines: Information Retrieval in Practice', 1st Edn., Pearson Education, **2009**.
3. Yates Ricardo and Berthier Ribeiro-Neto, 'Modern Information Retrieval', 2nd Edn., Addison-Wesley, **2011**.
4. Soumen Chakrabarti, 'Mining the Web', 1st Edn., Morgan-Kaufmann, **2002.**

ETHICAL HACKING

Subject Code: MCSE2-265 **L T P C** **Duration – 45 hrs**
3 1 0 4

COURSE OBJECTIVES: This course helps to gain knowledge of a range of computer network security technologies, tools and services related to ethical hacking.

COURSE OUTCOMES (COs)

CO1 To understand various fundamentals of Ethical hacking.
CO2 To understand how to extract information about hosts and networks.
CO3 To develop knowledge of various forms of attacks.
CO4 To understand about judicious and ethical use of various tools.

COURSE CONTENT:

UNIT I (11 hrs)

Introduction: Security, Functionality and ease of use Triangle, Essential Terminology, Elements of Security, Difference between Penetration Testing and Ethical Hacking, Deliverables ethics and legality, Computer Crimes and Implications.

Reconnaissance and Scanning: Information Gathering Methodology, Locate the Network Range, Active and Passive reconnaissance, Scanning, Elaboration phase, active scanning, scanning tools NMAP, hping2. Enumeration, DNS Zone transfer. Detecting live systems on the target network, discovering services running /listening on target systems, understanding port scanning techniques, Identifying TCP and UDP services running on the target network, Understanding active and passive fingerprinting

UNIT II (12 hrs)

Trojans and Backdoors: Effect on Business, Trojan, Overt and Covert Channels, Working of Trojans, Different Types of Trojans, Different ways a Trojan can get into a system, Indications of a Trojan Attack, some famous Trojans and ports used by them

Sniffing: Definition of sniffing, Sniffer working, Passive Sniffing, Active Sniffing, Ethreal tool, Man-in-the-Middle Attacks, Spoofing and Sniffing Attacks, ARP Poisoning and countermeasures.

Social Engineering: Social Engineering, Art of Manipulation, Human Weakness, Common Types of Social Engineering, Human Based Impersonation, Example of Social Engineering, Computer Based Social Engineering, Reverse Social Engineering, Policies and Procedures, Security Policies-checklist.

UNIT III (11 hrs)

Session Hijacking: Understanding Session Hijacking, spoofing vs Hijacking, Steps in Session Hijacking, Types of Session Hijacking, TCP Concepts 3 Way and shake, Sequence numbers

Hacking Web Servers: Types of web server vulnerabilities, Attacks against web servers, IIS Unicode exploits, Patch management techniques, Web Application Scanner, Metasploit Framework, Web server hardening methods

UNIT IV (11 hrs)

Ethical Hacking: System Hacking and Hacking Wireless Networks: Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing. Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

RECOMMENDED BOOKS

1. Kimberly Graves, 'Certified Ethical Hacking Expert Study Guide', Wiley Publishing Inc., **2007**.
2. Eric Core, 'Hackers Beware', EC-Council Press, **2003**.
3. William Stallings, 'Network Security Essentials', 5th Edn., Prentice Hall, **2013**.
4. William R. Cheswick and Steven M. Bellovin, 'Firewalls and Internet Security', 2nd Edn., Addison-Wesley Professional, **2003**.
5. W. Stallings, 'Cryptography and Network Security', 5th Edn., Prentice Hall, **2010**.

DISTRIBUTED SYSTEMS

Subject Code: MCSE1-163, MCSE2-266	**L T P C** **3 1 0 4**	**Duration – 45 hrs**

COURSE OBJECTIVES:

To study the various types of distributed systems, Models and various its various features.

COURSE OUTCOMES:

CO1: To give the students an introduction about the basic Distributed systems, Models and some features of operating systems.

CO2: To give the introduction of Interprocess communication and other features. Also, the details of distributed file systems.

CO3: To give the students an introduction of various services like name services, name system etc., and distributed transaction features.

CO4: To understand the Distributed multi-media and its applications.

COURSE CONTENT

UNIT- I (11)

Characterization of Distributed Systems: Introduction, System models –Architectural and fundamental models with examples.

Operating System Support: Operating System layer, Protection, processes and threads, operating system architecture.

UNIT –II (12)

Interprocess communication: API for internet protocol, Marshalling, Client server communication and group communication.

Distributed objects and remote invocation: communication between Distributed objects, RPC and characteristics.
Distributed File System: File service architecture, network file system, Sun network file system, Andrew file system Case Study: Unix

UNIT-III (11)

Name services: Name services and domain name system, directory and discovery services Case Study: Global Name service
Transaction and concurrency control: transactions, nested transactions, Locks, optimistic concurrency control, time stamp ordering, Comparison of methods for concurrency control
Distributed transaction: Flat and nested distributed transactions. Atomic Commit protocol, Distributed dead locks

UNIT-IV (11)

Distributed Multimedia systems: characteristics of multimedia, multimedia data. Quality of service management, resource management, stream adaptation. Case study; Tiger video file server.

RECOMMENDED BOOKS

1. G. Coulouis, et al., 'Distributed Systems: Concepts and Design', 5th Edn., Pearson Education Asia, Pearson, **2011**.
2. A.S. Tanenbaum, 'Modern operating Systems', 3rd Edn., Prentince Hall, **2015**.
3. Seema Shah and Sunita Mahajan, 'Distributed Computing', 1st Edn., Oxford University Press, **2010**.

GRID COMPUTING

Subject Code: MCSE2-267 **L T P C** **3 1 0 4** **Duration – 45 hrs**

COURSE OBJECTIVES

This course offers a good understanding of the concepts, methods and techniques of grid computing and application of grid computing and understanding the technology and tool kits to facilitate the grid computing.

COURSE OUTCOMES

CO1: To explain basics of grid computing and applications of grid computing.
CO2: To understand the Grid Computing Anatomy and to know the Open grid services Architecture.
CO3: To Explain the Grid Development Toolkits.
CO4: To explain the Message Passing Interface (MPI) Standard.

COURSE CONTENT

UNIT I (11 hrs)

Introduction to High Performance Computing: Early Grid Activities, Current Grid Activities, Grid Business Areas, Grid Applications. Grid Computing Organizations and Their Roles: Developing Grid Standards & Best Practice Guidelines, Developing Grid Computing Toolkits & Frameworks, Grid-Based Solutions to Solve Computing, Data, and Network Requirements, Building and Using Grid-Based Solutions Commercially.

UNIT II (12 hrs)

Grid Computing Anatomy: The Grid Problem, The Grid Computing Roadmap, Grid Services Architecture and Web Services Architecture. OGSA: Introduction, Sample Use Cases that Drive the OGSA, OGSA Platform Components, Open Grid Services Infrastructure (OGSI), OGSA Basic Services.

UNIT III (11 hrs)

The Grid Development Toolkits: GlobusGT3 Toolkit: Architecture, GlobusGT3 Toolkit: Programming Model, GlobusGT3 Toolkit: Implementation, GlobusGT3 Toolkit: High-Level Services.

UNIT IV (11 hrs)

Message Passing Interface (MPI) Standard: Overview, Procedures and Arguments, Data Types, Processes, Error Handling, Platform independence, Point-to-Point Communication, Collective Communication, Groups — Contexts Communicators, Process Technologies.

1. **RECOMMENDED BOOKS**
   Joshy Joseph, Craig Fellenstein, 'Grid Computing', 1st Edn., Pearson Education, **2004**.
   Vladimir Silva, 'Grid Computing for Developers', 1st Edn., Dreamtech Press, **2006**.
2. Ahmar Abbas, 'Grid Computing, A Practical Guide to Technology and Applications', 2nd Edn., Firewall Media, **2006**.
3. Ian Foster & Carl Kesselman, 'The Grid 2 – Blueprint for a New Computing Infrastructure', 2nd Edn., Morgan Kaufman, **2004**.
4. Joshy Joseph & Craig Fellenstein, 'Grid Computing', 2nd Edn., Pearson Education, **2004**.
5. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, 'Grid Computing: Making the Global Infrastructure a reality', 1st Edn., John Wiley and Sons, **2003**.

NETWORK PROGRAMMING

Subject Code: MCSE2-268 **L T P C** **3 1 0 4** **Duration – 45 hrs**

COURSE OBJECTIVES:

To understand interprocess and inter-system communication, socket programming in its entirety, usage of TCP/UDP / Raw sockets

COURSE OUTCOMES

CO1: To write socket API based programs
CO2: To design and implement client-server applications using TCP and UDP sockets
CO3: To analyze network programs
CO4: To understand how to build network applications

COURSE CONTENT

UNIT I (11 hrs)

Introduction: Overview of UNIX OS, Environment of a UNIX process, Process control, Process relationships Signals, Interprocess Communication, overview of TCP/IP protocols

UNIT II (11 hrs)

Elementary TCP sockets Introduction to Socket Programming, Introduction to Sockets, Socket address Structures, Byte ordering functions, address conversion functions, Elementary TCP Sockets, socket, connect, bind, listen, accept, read, write, close functions, Iterative Server, Concurrent Server.

UNIT III (12 hrs)

Application Development: TCP Echo Server, TCP Echo Client, Posix Signal handling, Server with multiple clients, boundary conditions: Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown, I/O multiplexing, I/O Models, select function, shutdown function, TCP echo Server (with multiplexing), poll function, TCP echo Client (with Multiplexing)

UNIT IV (11 hrs)

Socket options, elementary UDP sockets: Socket options, getsocket and setsocket functions, generic socket options, IP socket options, ICMP socket options, TCP socket options, Elementary UDP sockets, UDP echo Server, UDP echo Client, Multiplexing TCP and UDP sockets, Domain name system, gethostbyname function, Ipv6 support in DNS, gethostbyadr function – getservbyname and getservbyport functions.

Advanced Sockets: Ipv4 and Ipv6 interoperability, threaded servers, thread creation and termination, TCP echo server using threads, Mutexes, condition variables, raw sockets, raw socket creation, raw socket output, raw socket input, ping program, trace routeprogram.

RECOMMENDED BOOKS:

1. W. Richard Stevens, B. Fenner, A.M. Rudoff, 'Unix Network Programming – The Sockets Networking', 3rd Edn., API, Pearson, **2004**.
2. W. Richard Stevens, S.A. Rago, 'Programming in the Unix environment', 2nd Edn., Pearson, **2005**.

LINUX PROGRAMMING

Subject Code: MCSE2-269 **L T P C** **Duration – 45 hrs**
3 1 0 4

COURSE OBJECTIVES:

To understand and make effective use of Linux utilities and Shell scripting language (bash) to solve Problems and to implement in C some standard Linux utilities using system calls.

COURSE OUTCOMES:

CO1 Work confidently in Linux environment.
CO2 Work with shell script to automate different tasks as Linux administration.
CO3 To develop the skills necessary for systems programming including file system programming, process and signal management, and interprocess communication.
CO4 To develop the basic skills required to write network programs using Sockets.

COURSE CONTENT

UNIT I (11 hrs)

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities, sed – scripts, operation, addresses, commands, applications, awk – execution, fields and records, scripts, operation, patterns, actions, functions, using system commands in awk. Working with the Bourne again shell(bash): Introduction, shell responsibilities, pipes and input Redirection, output redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

UNIT II (11 hrs)

Files: File Concept, File System Structure, Inodes, File Attributes, File types, Library functions, the standard I/O and formatted I/O in C, stream errors, kernel support for files, System calls, file descriptors, low level file access, File structure related system calls (File APIs), file and record locking, file and directory management

UNIT III (11 hrs)

Process – Process concept, Kernel support for process, process attributes, process control - process creation, waiting for a process, process termination, zombie process, orphan process, Process APIs. Signals– Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function Interprocess Communication: Introduction to IPC, Pipes, FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory. Message Queues- Kernel support for messages, Unix system V APIs for messages, client/server example.

UNIT IV (12 hrs)

Semaphores-Kernel support for semaphores, Unix system V APIs for semaphores. Shared Memory- Kernel support for shared memory, Unix system V APIs for shared memory, semaphore and shared memory example. Multithreaded Programming: Differences between threads and processes, Thread structure and uses, Threads and Lightweight Processes, POSIX Thread APIs, Creating Threads, Thread Attributes, Thread Synchronization with semaphores and with Mutexes, Example programs. Sockets: Introduction to Sockets, Socket Addresses, Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs.

RECOMMENDED BOOKS:

1. T. Chan, 'Unix System Programming using C++', 1st Edn., PHI, **1997**.
2. Sumitabha Das, 'Unix Concepts and Applications', 4th Edn., TMH, **2006**.
3. N. Matthew, R. Stones, 'Beginning Linux Programming', 4th Edn., Wiley India, **2007**.

NETWORK PERFORMANCE AND EVALUATION

Subject Code: MCSE2-270 **L T P C** **Duration – 45 hrs**
3 1 0 4

COURSE OBJECTIVES

To strengthen students in primal principles, performance measure of different protocols for a Computer Networks and analysis of Computer Network protocols.

COURSE OUTCOMES

CO1: Describe and compare the basic technologies used in computer network systems
CO2: Evaluate performance of different protocols
CO3; Analyze the protocols used in computer networks
CO4: Study of different protocol as a stochastic process and use of simulation tools and SHARPE tool

COURSE CONTENT

UNIT I (11 hrs)

Review of Computer Networks, Wireless Sensor Networks

Performance Evaluation Parameter:

Bandwidth utilization, throughput, delays, error rate, congestion, and network reliability.

UNIT II (11 hrs)

Basics of Modelling and Simulation:

Random variables; probability distributions; expected value, Important distributions (uniform, Geometric, exponential, Joint distributions and independence, Conditional probability and conditional expectation

UNIT III (12 hrs)

Queuing Systems:
Arrival and service processes, Server disciplines, queuing networks: Open vs. closed networks, Product-form queuing networks,

Performance Measure of Different Protocols:
Stochastic processes: discrete-time and continuous-time, Markov chains, Performance analysis of ALOHA protocol, CSMA/CD, CSMA/CA. Analysis of Stop and wait protocols and Sliding window protocol.

UNIT IV (11 hrs)

Network Performance of Some More Protocols:
Extended queuing networks, Numerical solution of Markov chains, Open central server network example, Delay and throughput analysis of ARQ systems, FDM and TDM, Measure of response time for TCP and UDP; Markov and reliability models for Network system.

RECOMMENDED BOOKS:

1. Andrew S. Tanenbaum, 'Computer Networks', 4th Edn., Pearson Education, **2002**.
2. Youlu Zheng, Shakil Akhtar, 'Networks for Computer Scientists and Engineers', 1st Edn., Oxford University Press, **2001**.
3. Raj Jain, 'The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling', 1st Edn., John Wiley & Sons, **1991**.
4. Kishor S. Trivedi, 'Probability and Statistics with Reliability, Queueing, and Computer Science Applications', 2nd Edn., Wiley, **2008**.
5. Sheldon M. Ross, 'Introduction to Probability Models', 7th Edn., Academic Press, **2002**.
6. Miller & Freund's, 'Probability and Statistics for Engineers', 8th Edn., PHI, **2011**.
7. Sanjay K. Bose, 'An introduction to Queuing System', 1st Edn., Kluwer Academic/ Plenum Publishers, **2002**.
8. James F. Kurose, Keith W. Ross, Computer Networking: 'A Top-Down Approach Featuring the Internet', 6th Edn., Pearson Education, **2012**.
9. William Stallings, 'Data and Computer Communications', 7th Edn., Prentice Hall of India Publication, **2003**.
10. D. Bertsekas and R. Gallager, 'Data Networks', 2nd Edn., Prentice-Hall, **1992**.

OPEN SOURCE TECHNOLOGIES

Subject Code: MCSE2-271 **L T P C** **3 1 0 4** **Duration – 45 hrs**

COURSE OBJECTIVES:
To give a brief introduction to the open source technology. Through interactive sessions enabling students to enhance their skills in contributing and implementing their technical knowledge.

COURSE OUTCOMES

CO1: Open source software history, initiatives and principles. Open standards, Licenses and FOSS.

CO2: Learn about the Open Source Operating system and its distributions like Fedora, Google chrome OS, Ubuntu.

CO3: Study of Web technologies based on open Software's LAMP (Linux Apache MySqland PHP/Python)
CO4: To Learn HTML, XHTML, PHP and JavaScript

COURSE CONTENT

UNIT I (11 hrs)

Introduction: Open Source Definition, Free Software vs. Open Source Software, Public Domain Software, Open Source History, Initiatives, Principle and Methodologies. Open Standards.

Open Source Development Model Licenses and Patents: What Is a License, Important FOSS Licenses (Apache, BSD, GPL, LGPL), copyrights and copy lefts, Patents Economics of FOSS: Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization.

UNIT II (12 hrs)

Open Source Operating Systems: Different open source operating systems. Google Chrome OS, BSD, Linux Distributions – Fedora and Ubuntu, Installation, Disk Partitioning, Boot loader. Using Linux – Shell, File system familiarity, Linux Administration – Managing users, services and software, Network Connectivity, Configurations and Security.

Open Source Web Technologies: Two Tier and Three Tier Web based Application Architecture. LAMP Terminologies, Advantages. Apache, Web server conceptual working, Web browser, HTTP, Installation and Configuration, httpd.conf file, Logging, Security, Running a website, MySQL, Database management system, ER diagram, Relational database, Installation, Configuration, Administration, Common SQL queries.

UNIT III (11 hrs)

Programming on XHTML and XML: Editing XHTML, W3C XHTML validation services, designing XHTML by using XHTML tables, frames, forms and other elements. CSS and its types. XML, XML namespaces, DTD, XML schema, XML vocabularies, DOM and its methods, SOAP.

UNIT IV (11 hrs)

Programming on PHP and JavaScript:

JavaScript: JavaScript variables, control structures, functions, arrays and objects. Cascading Style Sheets, Client Side Scripting - Java Script, PHP: Form processing and business logic, stream processing and regular expressions, viewing client/server environment variables, connecting to database and handling of cookies. SQL, Accessing databases with PHP.

Open Source Ethics: Open source vs. closed source Open source government, Open source ethics. Social and Financial impacts of open source technology, shared software, Shared source.

Case Studies: Mozilla (Firefox), Wikipedia, Joomla, Open Office, GCC.

RECOMMENDED BOOKS:

1. B. Ware, B. Lee J., 'Open Source Development with Lamp: Using Linux, Apache, MySQL, Perl, and PHP', Addison-Wesley Professional, **2002**.
2. Deitel, 'Internet and World wide web: How to Program', 4th Edn., Prentice Hall, **2008**.
3. P. DuBois, 'MySQL', Addison-Wesley Professional, 5th Edn., **2013**.
4. M. Zandstra, 'Teach Yourself PHP in 24 Hours', 3rd Edn., Sams Publishing, **2003**.

PRACTICAL LAB-II

Subject Code: MCSE2-207 **L T P C** **Duration – 60 hrs**
0 0 4 2

COURSE CONTENT

- Practicals should be related to the core subjects of the same semester.