



## **M.Sc. (Computer Science) Syllabus**

Under the

**CHOICE BASED CREDIT SYSTEM  
(With effect from 2022-23 onwards)**

**DEPARTMENT OF COMPUTER SCIENCE**

**M.SC. I YEAR I SEMESTER:**

Paper No	Paper Title/Subject	Workload Per Week (Theory & Lab)	MARKS			CREDITS
			Internal	External	Total	
MSCCS111	DISCRETE MATHEMATICS	04	20	80	100	4
MSCCS112	OOPS WITH JAVA	04	20	80	100	4
MSCCS113	OPERATING SYSTEMS	04	20	80	100	4
MSCCS114	COMPUTER NETWORKS	04	20	80	100	4
MSCCS115	OOPS WITH JAVA LABORATORY	04	0	75	75	3
MSCCS116	OPERATING SYSTEM LABORATORY	04	0	75	75	3
MSCCS117	COMPUTER NETWORKS LABORATORY	04	0	75	75	3
MSCCS118	SEMINAR	--	25		25	1
					650	26

<b>MSCCS111</b>	<b>DISCRETE MATHEMATICS</b>	<b>DM</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **UNIT - I**

**FUNDAMENTALS:** Sets, Relations and functions, Fundamental of logic, Logical inferences, First order logic, Quantified propositions, Mathematical induction

**ELEMENTARY COMBINATORICS:** Combinations and Permutations, Enumeration with Repetitions, with constrained repetitions, The Principle of Inclusion-Exclusion.(Chapters 1-2)

### **UNIT -II**

**RECURRENCE RELATIONS:** Generating functions, Coefficients of Generating functions, Recurrence Relations, Inhomogeneous Recurrence Relations (Chapter-3)

### **UNIT - III**

**RELATIONS AND DIAGRAMMS:** Relations and diagrams, Binary relations, Equivalence relations, Ordering relations, Lattices, Paths and Closures, Directed graphs, Adjacency matrices-Applications, Sorting and Searching (Chapter - 4)

### **UNIT - IV**

**GRAPHS:** Graphs, Isomorphism, Trees, Spanning trees, Binary trees, Planar graphs, Euler's Circuits, Hamiltonian graphs, Chromatic numbers, Four-color problem, Network flows (Chapter 5)

### **TEXT-BOOK:**

1. Discrete Mathematics For Computer Scientists, By - J L Mott, A Kandel And T Pbaker

### **REFERENCE BOOKS:**

1. Discrete Mathematical Structure - (Tmh) By - Trembley And Manohar
2. Discrete Mathematics With Algorithms - (John Wiley) By - M.O. Albertson And J.P.Hutchinson
3. Elements Of Discrete Mathematics-(Tmh, Second Edition) By - C.L.Liu
4. Discrete Mathematics - (Phi, Third Edition) By - Burnord Kolman
5. Discrete Mathematics By Kh Rossen (Tmh)
6. Discrete Mathematics By S Lipschutz And M. Lipson Schaum"s Series (Tmh)
7. Discrete Mathematics For Computer Science By Garry Haggard, J. Schilpf And S White Sides (Thomson Press)
8. Discrete & Combinatorial Mathematics By Ralph P Grimaldi (Pearson Education)
9. Discrete Mathematical Structures By Ds Mallik & M K Sen (Thomson Press)

<b>MSCCS112</b>	<b>OOPS WITH JAVA</b>	<b>OOPS</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

**UNIT I**

Introducing Classes, A Closer Look at Methods and Classes- Inheritance, Packages and Interfaces.  
(Chapters 6, 7, 8 and 9)

**UNIT II**

Exception Handling – Multithreaded Programming – Enumerations, Autoboxing, Static Import and Annotations (Chapters 10, 11, 12)

**UNIT III**

String Handling, Collection Framework, Primitive type wrappers, Exploring java.io (Chapters 15, 17 & 19)

**UNIT IV**

The Applets classes, Events handling, understanding layout Managers– Introducing Swings, exploring swing (Chapters 22, 23, 30, 31)

**TEXT BOOK:**

1. Java the Complete Reference 8<sup>th</sup> Edition, Herbert Schildt, Tata McGrawHill Edition  
References

1. Beginning Java, Java 7<sup>th</sup> Edition, Ivor Horton's, Wiley India Edition.
2. Java A Beginner's Guide, Fifth Edition, Tata McGRAW-HILL.

<b>MSCCS113</b>	<b>OPERATING SYSTEMS</b>	<b>OS</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **UNIT - I**

INTRODUCTION: What is an Operating Systems?, Mainframe Systems, Desktop Systems, Distributed Systems, Real-Time Systems, Handheld Systems, Feature Migration, Computing Environments. COMPUTER-SYSTEM STRUCTURES: Computer - System Operation, I/O Structure, Storage Structure, Hardware protection, Network Structure. OPERATING SYSTEM STRUCTURE: System Components, Operating System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation. PROCESSES: Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Inter process Communication, communication in Client-Server Systems. Multithreading concepts, Multithreading Models, Java Threads. (Chapters 1, 2, 3, 4 and 5)

### **UNIT - II**

CPU SCHEDULING: Basic concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Process Scheduling Models. PROCESS SYNCHRONIZATION: Background, The Critical-Section Problem, synchronization Hardware, Semaphores, Critical Regions, Monitors, OS Synchronization. DEADLOCKS: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection. (Chapters 6, 7 and 8)

### **UNIT - III**

MEMORY MANAGEMENT: Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation. VIRTUAL MEMORY: Background, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing. FILE SYSTEM INTERFACE & IMPLEMENTATION: File Concept, Access Methods, Directory Structure, File-System Mounting, File Sharing, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space Management, and Recovery. (Chapters 9, 10, 11 and 12)

### **UNIT - IV**

MASS-STORAGE STRUCTURE: Disk Structure, Disk Scheduling, Disk Management, Swap Space Management, RAID Structure, Disk Attachment, Stable-Storage Implementation. PROTECTION: Goals of Protection, Domain of Protection, Access Matrix, Implementation of access Matrix, Revocation of Access Rights, Capability-Based Systems. (Chapters 14 and 18)

### **TEXT BOOKS**

1. OPERATING SYSTEM CONCEPTS (6th Edition) By - SILBERSCHATZ, GALVIN, GAGNE Jhon-Wiley (2002)

### **REFERENCE BOOKS**

1. Operating Systems (Iv Edition) By - William Stallings Phi (2002)
2. Operating Systems By - Gary Nutt (Pearson Education)
3. Operating Systems By - Charles Crowley Tmh (2000)

<b>MSCCS114</b>	<b>COMPUTER NETWORKS</b>	<b>CN</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **UNIT - I**

COMPUTER NETWORKS AND THE INTERNET: What is the Internet?, What is a Protocol?, The Network Edge, The Network Core, Access Networks and Physical Media, Delay and Loss in Packet-Switched Networks, Protocol Layers and Their Service Models, Internet Backbones, NAPs, and ISPs, A Brief History of Computer Networking and the Internet. APPLICATION LAYER: Principles of Application Layer Protocols, The World Wide Web: HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS - The Internet's Directory Service. (Chapter 1 and Chapter 2.1 to 2.5)

### **UNIT - II**

TRANSPORT LAYER: Transport-Layer Services and Principles, Multiplexing and DE multiplexing Applications, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control. (Chapter 3.1 to 3.6)

### **UNIT - III**

NETWORK LAYER AND ROUTING: Introduction and Network Service Models, Routing Principles, Hierarchical Routing, Inter Protocol, Routing in the Internet, What's Inside a Router? (Chapter 4.1 to 4.6)

### **UNIT - IV**

LINK LAYER AND LOCAL AREA NETWORKS: The Data Link Layer: Introduction, Services, Error Detection and Correction Techniques, Multiple Access Protocols and LAN's, LAN Addresses and ARP, Ethernet, Hubs, Bridges, and Switches, IEEE 802.11 LANs, PPP: The Point-to-Point Protocol, Asynchronous Transfer Mode (ATM), X.25 and Frame Relay. (Chapter 5.1 to 5.10)

### **TEXT BOOK:**

1. Computer Networking A Top-Down Approach Featuring The Internet By - James F. Kurose And Keith W. Ross (Pearson)

### **REFERENCE BOOKS:**

1. Business Data Communication & Networks By - Fitz Gerald (John Wiley)
2. Data & Computer Communications - W Stallings (Pearson, Phi)
3. Computer Communications&Networking Topologies-Magallo, V.M.Hancock (Thomson)
4. Data Communication & Computer Networks - R. Agarwal, Bb Tiwari (Vikas)
5. Computer Networks - As Tanenbaum (Phi)
6. Computer Networks - Black (Phi)
7. Under Standing Communications & Networks - Wa Shay (Thomson)

<b>MSCCS115</b>	<b>OOPS WITH JAVA LAB</b>	<b>SLL</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>

The concepts covered in the corresponding theory paper are to be implemented.

<b>MSCCS116</b>	<b>OPERATING SYSTEMS LAB</b>	<b>OSL</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>

1. Simulate the following CPU Scheduling algorithms
  - a) Round Robin
  - b) **SJF**
  - c) FCFS
  - d) Priority
2. Simulate all file allocation strategies.
  - a) Sequential
  - b) Indexed
  - c) Linked
3. Simulate MVT and MFT
4. Simulate all File organization techniques.
  - a) Single level directory
  - b) Two level
  - c) Hierarchical
  - d) DAG
5. Simulate Bankers Algorithm for Dead Lock Avoidance
6. Simulate Bankers Algorithm Dead Lock Prevention.
7. Simulate all Page replacement algorithms.
  - a) FIFO
  - b) LRU
  - c) LFU
  - d) Etc....
8. Simulate Paging Techniques of memory management.
9. Shell Programming.
  - a) Writing Simple shell scripts
  - b) Control structures - sequence, selection, iteration
  - c) Pipes & Redirections
  - d) Passing arguments to shell programs
  - e) Simple programs using system calls
10. UNIX System Administration:
  - a) User account maintenance
  - b) Security
  - c) Print jobs
  - d) Backup
  - e) Package installations
  - f) Resource management
  - g) Device drivers

<b>MSCCS116</b>	<b>COMPUTER NETWORKS LAB</b>	<b>NAPL</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>

**PART A - Simulation Exercises**

*The following experiments shall be conducted using either NS228/OPNET or any other simulators.*

1. Simulate a three nodes point-to-point network with duplex links between them.  
Set the queue size vary the bandwidth and find the number of packets dropped.
2. Simulate a four node point-to-point network, and connect the links as follows:  
n0- n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets by TCP/UDP.
3. Simulate the different types of Internet traffic such as FTP a TELNET over a network and analyze the throughput.
4. Simulate the transmission of ping messaged over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
5. Simulate an Ethernet LAN using N-nodes(6-10), change error rate and data rate and Compare the throughput.
6. Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and determine collision across different nodes.
7. Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and plot congestion window for different source/destination.
8. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation  
And determine the performance with respect to transmission of packets.



<b>MSCCS118</b>	<b>SEMINAR</b>	<b>S</b>
<b>WORK LOAD: 0 2</b>	<b>INTERNAL MARKS: 25</b>	<b>EXTERNAL MARKS: 00</b>

- This course is meant to give students practice of speaking in front of an audience and to explore topics of their own choosing in detail.
- Students have to search topics and organize presentations for faculty and other students. The topics may be any aspect of the Computer science and must be approved by the instructor in advance.
- To improve students speaking skills, each student has to receive feedback from the fellow students and the instructor.

**Expectations:**

- Attendance at each seminar is mandatory for all students enrolled.
- In addition, students are expected to attend all other seminars in the department, such as invited guest speakers. It is expected that students will actively participate by asking questions of the speaker.
- The effort by students to meet these expectations will be considered in the determination of your final grade.

**M.SC. I YEAR II SEMESTER:**

Paper No	Paper Title/Subject	Workload Per Week (Theory & Lab)	Marks			CREDITS
			Internal	External	Total	
MSCCS121	COMPUTER ORGANIZATION	04	20	80	100	4
MSCCS122	ADVANCED JAVA	04	20	80	100	4
MSCCS123	UNIX NETWORK PROGRAMING	04	20	80	100	4
MSCCS124	SOFTWARE ENGINEERING	04	20	80	100	4
MSCCS125	ADVANCED JAVA LABORATORY	04	0	75	75	3
MSCCS126	UNIX NETWORK PROGRAMING LABORATORY	04	0	75	75	3
MSCCS127	SOFTWARE ENGINEERIG LABORATORY	04	0	75	75	3
MSCCS128	SEMINAR	--	25		25	1
					650	26

<b>MSCCS121</b>	<b>COMPUTER ORGANIZATION</b>	<b>CO</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **UNIT - I**

**BASIC STRUCTURE OF COMPUTER HARDWARE AND SOFTWARE:** Functional units, Basic operational concepts, Bus structures, Software, Performance, Distributed Computing.

**LOGIC CIRCUITS:** Basic Logic Functions, Synthesis of Logic Functions Using AND, OR, and NOT Gates, Minimization of Logic Expression, Synthesis with NAND and NOR Gates, Practical Implementation of Logic Gates, Flip-Flops, Registers and Shift Registers, Counters, Decoders, Multiplexers, Sequential Circuits. (Chapter 1, A.1 to A.13)

### **UNIT - II**

**ADDRESSING METHODS:** Basic Concepts, Memory Locations, Main Memory Operations, Addressing Modes, Assembly Language, Basic I/O operations, Stacks and Queues, Subroutines. **PROCESSING UNIT:** Some Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Considerations, Micro Programmed Control, Signed Addition and Subtraction, Arithmetic and Branching Conditions, Multiplication of Positive Numbers, Signed-Operand, Integer Division, Floating-Point Numbers.(Chapter 2.1 to 2.83, 6.4 to 6.10)

### **UNIT - III**

**INPUT-OUTPUT ORGANIZATION:** Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, I/O Hardware, Standard I/O Interfaces, The Motorola 680X0 Family, The Intel 80X86 Family, The Power PC Family, The Alpha AXP Family, Architectural and Performance Comparisons, A Stack Processor. (Chapter 4, 8.1 to 8.6)

### **UNIT - IV**

**MEMORY:** Semiconductor RAM memories, Read-Only Memories, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements.

**INTRODUCTION TO COMPUTER PERIPHERALS:** I/O Devices, On-Line Storage. (Chapter 5, 9.1, 9.2)

### **TEXT BOOK:**

1. Computer Organization, Tmh (Iv Edition) By - V.C. Hamacher

### **REFERENCES:**

1. Computer Organization, (Phi) By - Moris Mano
2. Computer Architecture & Organisation by - Hayes, (Tmh)
3. Computer Systems Organisation & Architecture By - Carpinelli, (Addison Wesley)
4. The Architecture Of Computer Handwone And Sytems Handwone By- Englander (Wiely).
5. Computer Sytems Design And Architecture By- Vp Heuring, Hf Jordan (Pearson).
6. Computer Organization & Architectures By – Stallings (Pearson, Phi).
7. Computer Organization & Design By - Pp Chaudari (Phi)

<b>MSCCS122</b>	<b>ADVANCED JAVA PROGRAMMING</b>		<b>ADJ</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>	

**UNIT - I**

Network Programming, RMI, Naming Service, Serialization and Internationalization.  
(Chapter 3, 4)

**UNIT -II**

Working with JDBC- introduction, exploring JDBC Drivers, Exploring the features of JDBC, Jdbc APIs, exploring major classes and interfaces, java.sql package, working with transactions, Introducing the Java EE platform. (Chapters 2, 5)

**UNIT - III**

Working with servlets, introducing Event Handling and Filters. (Chapters 6 and 7)

**UNIT - IV**

Working with Java Server Pages (JSP), JSP Tag Extensions and standard Tag Library  
(chapter 8 & 9)

**TEXT-BOOK**

1. Advance Java Technology – Prof. Savaliya- Dreamtech Press.
2. Java Server Programming (J2EE), Block Book, DreamTech Press.

**REFERENCE BOOKS**

1. Java Server Pages -Hans Bergsten, SPD O'Reilly.
2. J2EE 1.4 Bible (Dreamtech-2003).
3. JAVA HOW TO PROGRAM Third Edition - Deitel & Deitel.
4. Java Server Programming, J2EE 1.6- KONGENT- Dreamtech press.
5. THE JAVA TUTORIAL CONTINUED Compione, Walrath, Huml, Tutorial Team - Addison Wesley

<b>MSCCS123</b>	<b>UNIX NETWORK PROGRAMMING</b>	<b>UNP</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

**UNIT - I**

Inter-process Communication: Introduction, File and Record Locking, Simple Client- server Pipes, FIFO's, Streams and Messages, Name Spaces, System V IPC, Message Queues, Semaphores, Shared Memory, Socket and TLI. (Chapters 3, 3.1 to 3.12)

**UNIT - II**

A Network Primer Communication Protocols: Introduction, TCP/IP, XNS, SNA, NetBIOS, OSI Protocol, UUCP, Protocols Comparisons. (Chapters 4, 5, 5.1 to 5.8)

**UNIT - III**

Berkeley Sockets: Introduction, Overview, Unix Domain Protocols, Socket Addresses, Elementary Socket System Calls, Simple Examples, Advanced Socket System Calls, Reserved Ports, Stream Pipes, Passing File Descriptors, Socket Options, Asynchronous I/O, Input / Output Multiplexing, Out-of-Band and Data, Sockets and Signals, Internet Superserver, Socket Implementation. (Chapters 6, 6.1 to 6.17)

**UNIT - IV**

Transport, Overview, Transport Endpoint Addresses, Elementary TLI Functions, Simple Example, Advanced TLI Functions, Streams, TLI Implementation, Stream Pipes, Passing File Descriptors, Input/output Multiplexing, Asynchronous I/O, Out-of-Band Data. (Chapter 7.1 to 7.13)

**TEXT BOOK:**

1.Unix Network Programming By W. Richard Stevens

**REFERENCE BOOKS:**

1. Unix Systems Programming - K.A. Robbins, S. Robbins (Pearson)
- 2.Unix The C Odyssey - M. Gandhi, Shetti, Shah (Bpb Publications)

<b>MSCCS124</b>	<b>SOFTWARE ENGINEERING</b>	<b>SE</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **UNIT - I**

**INTRODUCTION TO SOFTWARE ENGINEERING:** The Evolving Role of Software - Software - The Changing Nature of Software - Software myths. **A GENERIC VIEW OF PROCESS:** Software Engineering-A Layered technology - A Process frame work - The capability Maturity Model Integration (CMMI) - Process Patterns - Process Assessment - Personal and Team Process Models - process Technology - Product and Process. **PROCESS MODELS:** Prescriptive Models - The waterfall Model - Incremental Process Models-Evolutionary Process Models - Specialized Process Models - The Unified Process. (Chapters1, 2 and 3)

### **UNIT- II**

**SOFTWARE ENGINEERING PRACTICE:** Software engineering Practice - Communication Practice- Planning Practices - Modeling Practices - Construction Practice - deployment **SYSTEM ENGINEERING:** Compute-Based systems - The System Engineering Hierarchy - Business Process Engineering: An Overview - Product Engineering:An Overview - System Modeling.**REQUIRMENT ENGINEERING:** A Bridge to Design and Construction - Requirements EngineeringTasks - Initiating the Requirements Engineering Process - Eliciting Requirements- Developing Use - Cases - Building the analysis Model - Negotiating Requirements - Validating Requirements. **BUILDING THE ANALYSIS MODEL:** Requirements Analysis - Analysis Modeling Approaches – Data Modeling Concepts-Object-oriented Analysis - Scenario-Based Modeling - Flow-OrientedModeling - Class-Based Modeling - Creating a Behavioral Model. (Chapters 5, 6, 7, 8)

### **UNIT - III**

**DESIGN ENGINEERING:** Design within the Context of Software Engineering - design Process andDesign Quality - Design Concepts - The Design Model - Pattern-Based Software Design. **CREATING AN ARCHITECTURAL DESIGN:** Software Architecture - Data Design - Architectural Styles and Patterns - Architectural Design- Assessing Alternative Architectural Designs - Mapping Data Flow into Software Architecture. **MODELING COMPONENT-LEVEL DESIGN:** What is a Component? - Designing Class-Based Component-Level Design - Object Constraint Language - designing Conventional Components. (Chapters 9, 10 and 11)

### **UNIT - IV**

**PERFORMING USER INTERFACE DESIGN:** The Golden Rules - User Interface Analysis and Design- Interface Analysis - Interface Design Steps - Design Evaluation.**RISK MANAGEMENT:** Reactive vs. Proactive Risk Strategies - Software Risks - Risk Identification - Risk Projection - Risk Refinement - Risk Mitigation, Monitoring, and Management - The RMMM Plan.**QUALITY MANAGEMENT:** Quality Concepts - Software Quality Assurance - Software Reviews -Formal Technical Reviews - Formal Approaches to SQA - Statistical Software Quality Assurance -Software Reliability - The ISO 9000 Quality Standards - The SQA Plan. (Chapters 12, 25, 26)

### **TEXT BOOK:**

1. Software Engineering By R.S. Pressman (Mc. Graw Hill Sixth Edition)

### **REFERENCE BOOKS:**

1. Software Engineering By Ghezzi (Phi)
2. Software Engineering Fundamentals By Behforooz And Hudson  
Oxforduniversity Press
3. Software Engineering By Fairley (Mc.Graw Hill)

<b>MSCCS125</b>	<b>ADVANCED JAVA LAB</b>	<b>ADJL</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>

The concepts covered in the corresponding theory paper are to be implemented.

<b>MSCCS126</b>	<b>UNIX NETWORK PROGRAMMING LAB</b>	<b>UNPL</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>

Programs Using UNIX or LINUX

1. Write a program that takes one or more file/directory names as command line input and reports the following information on the file:
  - a. File type
  - b. Number of links
  - c. Time of last access
  - d. Read, Write, Execution permissions.
2. Write a „C“ program that illustrates how to execute two commands concurrently with a command pipe.
3. Write a „C“ program that illustrates the creation of child process using fork system call.
4. Write a „C“ program that illustrates the real time of a day every 60 seconds.
5. Write a „C“ program that illustrates implementation of ls command.
6. Write a „C“ program that illustrates simple file locking.
7. Write a „C“ program that illustrates to read or write from a file.
8. Write a „C“ program that illustrates the following
  - a. Creation of FIFO
  - b. Reading from FIFO
  - c. Writing on to the FIFO.
9. Write a „C“ program that illustrates sending the data from parent to child using PIPE System Call.
10. Write a „C“ program which displays the current working directory by using **popen**.
11. Write a „C“ program that illustrates the file locking using semaphores.
12. Write a „C“ program that illustrates Read or Write operation using semaphore.
13. Write a „C“ program that illustrates the creation of shared memory.
14. Write a „C“ program that illustrates inter-process communication using shared memory system calls.
15. Write a „C“ program that illustrates the following
  - a. Creating a message queue
  - b. Writing to a message queue
  - c. Reading from a message queue

**BOOK FOR REFERENCE:**

1. Unix The C Odyssey - M. Gandhi, Shetti, Shah (Bpb Publications)
2. Unix Network Programming - W. Richard Stevens

<b>MSCCS217</b>	<b>SOFTWARE ENGINEERING LAB</b>		<b>STL</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>	

SOFTWARE TESTING – Introduction, purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs. Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle. Basic Structural Modeling: Classes, Relationships, Class & Object Diagrams. Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams, Component, Deployment, Component diagrams and Deployment diagrams; Case Study on Unified Library Application(ULA).

# To learn and use the testing tools to carry out the functional testing, load/stress testing and use the following (or similar) automated testing tools to automate testing:

- a) Win Runner/QTP for functional testing.
- b) Load Runner for Load/Stress testing.
- c) Test Director for test management.

#### **List of Sample Programs /Experiments**

1. The student should take up the case study of Unified Library Application (ULA) which is mentioned in the theory, and Model it in different views i.e Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.
2. Student has to take up another case study of his/her own interest and do the same whatever mentioned in first problem. Some of the ideas regarding case studies are given in reference books which were mentioned and it would be referred for some new idea.

#### **REFERENCE BOOKS:**

1. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech
2. Software Testing Concepts and Tools, P.Nageswara Rao, Dreamtech Press.
3. Grady Booch, James Rumbaugh, Ivan Jacobson : The Unified Modeling Language User Guide, Pearson Education 2nd Edition



<b>MSCCS128</b>	<b>SEMINAR</b>	<b>S</b>
<b>WORK LOAD: 0 2</b>	<b>INTERNAL MARKS: 25</b>	<b>EXTERNAL MARKS: 00</b>

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**M.SC. II YEAR I SEMESTER:**

Paper No	Paper Title/Subject	Workload Per Week (Theory & Lab)	M			CREDITS
			Internal	External	Total	
MSCCS211	AUTOMATA THEORY AND FINITE LANGUAGES	04	20	80	100	4
MSCCS212	DATA WAREHOUSING AND MINING	04	20	80	100	4
MSCCS213 <b>Elective-1</b>	a) .NET PROGRAMMING b) PYTHON PROGRAMMING	04	20	80	100	4
MSCCS214 <b>Elective-2</b>	a) PHP PROGRAMMING b) PROGRAMMING WITH R	04	20	80	100	4
MSCCS215	DATA WAREHOUSING AND MINING LAB	04	0	75	75	3
MSCCS216 <b>Elective-1</b>	a) .NET PROGRAMMING LAB b) PYTHON PROGRAMMING LAB	04	0	75	75	3
MSCCS217 <b>Elective-2</b>	c) PHP PROGRAMMING a) PROGRAMMING WITH R LAB	04	0	75	75	3
MSCCS218	SEMINAR	--	25		25	1
					675	27

<b>MSCCS211</b>	<b>AUTOMATA THEORY AND FINITE LANGUAGES</b>	<b>AFL</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **UNI - I**

FINITE AUTOMATA AND REGULAR EXPRESSIONS : Preliminaries, Finite state systems, Nondeterministic finite automata (NFA), Deterministic finite automata (DFA), NFA TO DFA conversion Regular expressions, interconversions, Two-way finite automata, finite automata with output, State minimization applications. PROPERTIES OF REGULAR SETS: Pumping Lemma, closure properties of regular sets. (Chapters 1, 2, 3.1 and 3.2)

### **UNIT - II**

CONTEXT FREE GRAMMARS (CFG): Context free grammars Derivation tree, simplification of context - Free grammars, Normal forms. PUSHDOWN AUTOMATA: Informal description, Definitions, pushdown automata design. (Chapters 4.1 to 4.6, 5)

### **UNIT - III**

PROPERTIES OF CONTEXT FREE LANGUAGES (CFL): Pumping Lemma, closure properties, decision algorithms for CFLs. TURING MACHINES (TM): The turning machine & model, computable languages and functions, design of TM, modification of TM, Church's hypothesis. (Chapters 6, 7)

### **UNIT - IV**

RECURSIVE & RECURSIVELY INNUMERABLE LANGUAGES: UNDECIDABILITY: Properties of recursive and recursively innumerable languages, Universal turing machine, post correspondence problem. Decidable and Undecidable problems, universal turing machine, Rice's theorem. THE CHOMSKY HIERARCHY: Regular grammars, Unrestricted grammars, interconversions between regular grammars and finite automata, context - sensitive languages, (Chapters 8.1 to 8.8, 9)

### **Text Book:**

1. Introduction to Automata Theory Languages and Computation by - J.E. Hopcroft, J.D. Ullman (Narosa)

**Note:** For Examples refer the book. Introduction to computer Theory - DIA Cohen (John Wiley)

### **REFERENCE BOOKS:**

1. Introduction To Computer Theory-Daviel I.A.Cohen (John Wiley, Iind Edition)
2. Introduction To Languages And Theory Of Computation By - John C. Martin (Second Edition Tmh)
3. Theory Of Computation By - Chandra Sekharan & Misra (Phi)
4. Introduction To Automata Thoery, Languages & Computation - Je Hopfcroft, R. Motwani, Jd Ullman (Pearson)
5. The Theory Of Computation Bernard M Moret (Pearson)
6. Introduction To Theory Of Computation - M Sipser (Thomson)

<b>MSCCS212</b>	<b>DATA WAREHOUSE AND DATA MINING</b>		<b>DMW</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>	

#### **UNIT-I**

Data Mining- Data Mining Overview, Kinds of Data can be mined, Kinds of patterns can be mined, Data Mining Functionalities, Technologies used, Data Mining Applications, Major issues in Data Mining, Data objects and attribute types, Basic statistical descriptions of data, Measuring Data Similarity and Dissimilarity. (Chapters 1, 2.1 to 2.2.2, 2.4)

#### **UNIT-II**

Data Pre-Processing: Data Cleaning, Data Integration - Data reduction: Overview, Attribute subset selection, clustering, sampling, Data cube Aggregation, Histograms. Data Transformation and Data Discretization and concept Hierarchy Generation. Data Warehouse: Basic Concepts, Data Warehouse modeling, Data Warehouse Design. Data Warehouse implementation- Data cube implementation overview and OLAP server architecture, Attribute oriented induction. (Chapters 3.1 to 3.5, 4.1, 4.2, 4.3, 4.3.1, 4.3.2, 4.3.3, 4.4, 4.4.1, 4.4.4,4.5)

#### **UNIT-III**

Basic Concepts of frequent patterns- Frequent Item sets, Mining methods, Apriori and FP- Growth, Association rules. Classification and Prediction: Classification by Decision Tree Induction- Information gain, Gini Index, Tree Pruning. Classification methods: Bayesian Classification, Rule-Based Classification. Model evolution and Selection: Metrics for evaluating (Chapters 6.1, 6.2, 8.1, 8.2, 8.3, 8.4, 8.5)

#### **UNIT - IV**

Cluster analysis: Overview of Clustering Analysis Methods, Partitioning Methods- K-Means, K-Medoids. Hierarchical methods- BRICH. Density-based methods- DB-SCAN, DENCLUE. Grid Based methods- STING. Evolution of Cluster Analysis Overview. Outliers, Outlier Analysis. (Chapters 10.1, 10.2, 10.3, 10.3.1, 10.3.2, 10.3.3, 10.4.1, 10.4.3, 10.5.1, 10.6, 12.1)

#### **TEXT BOOK:**

1. DATA MINING CONCEPTS & TECHNIQUES BY JIAEEI HAN, MICHELINE & KAMBER (3<sup>rd</sup>EDITION) Harcourt India (Elsevier Publishing Company)

#### **REFERENCE BOOKS:**

1. Data Mining Introductory and advanced topics-MARGARET H DUNHAM, PEARSON EDUCATION
- 2.Data Mining Techniques - ARUN K PUJARI, University Press.
- 3.Data Warehousing in the Real World - SAM ANAHORY & DENNIS MURRAY. Pearson Ed Asia.
- 4.Data Warehousing Fundamentals - PAULRAJ PONNAIAH WILEY STUDENT EDITION
5. DATA WAREHOUSING, DATA MINING & OLAP BY ALEX BERSON AND STEPHEN J. SMITH (TMH)

<b>MSCCS213 (elective) (A)</b>	<b>.NET PROGRAMMING</b>	<b>.NET</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

#### **UNIT - I**

Fundamentals of Visual Basic, Exception handling, windows forms, Control Classes, Different Types of Boxes, Labels, Buttons, Panels. (Chapters 1 to 7)

#### **UNIT - II**

WINDOWS FORMS: Different types of Bars, Menus, Views. OBJECT - ORIENTED PROGRAMMING: Classes and objects constructors and destructors, inheritance, modifiers, Interfaces, Polymorphism, Vate Binding, Graphics handling and File handling. (Chapters 8 to 13)

#### **UNIT - III**

WEB FORMS: Working with web forms, Web forms and HTML, The Web control class, Web Forms and Boxes, Web Forms and Buttons, Validation Controls, Ad Rotators, Web Forms and HTML controls. (Chapters 14 to 19)

#### **UNIT - IV**

DATA ACCESS WITH ADO.NET : Accessing data with the server explorer, Data adapters and Data sets, Binding Controls to databases, Handling databases in code, Database access in Web Applications. Creating user Controls, Webuser Controls, and Multithreading creating Windows services, Web Services and Deploying applications. (Chapters 20 to 25)

#### **TEXT BOOK:**

1. VB.NET Programming (Black Book) By Steven Holzner (Dreamtech- 2003) REFERENCE

#### **REFERENCE BOOKS:**

1. VB.NET Programming By T. Gaddis (Dreamtech)
2. Microsoft Visual Basic. Net step by step By Halvosrson (PHI)
3. OOP with Microsoft Visual Basic.Net By Reynold Hacrtte (PHI)

<b>MSCCS213 (elective) (B)</b>	<b>PYTHON PROGRAMMING</b>	<b>.NET</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **Unit - I**

**Introduction to Python Programming:** How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations (Operators, Type conversions, Expressions), More about Data Output. **Decision Structures and Boolean Logic:** if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. **Repetition Structures:** Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

### **Unit - II**

**Functions:** Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions- Generating Random Numbers, Writing Our Own Value-Returning Functions, The math Module, Storing Functions in Modules. **File and Exceptions:** Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.

### **Unit - III**

**Lists and Tuples:** Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples. **Strings:** Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. **Dictionaries and Sets:** Dictionaries, Sets, Serializing Objects. **Recursion:** Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms.

### **Unit - IV**

**Object-Oriented Programming:** Procedural and Object-Oriented Programming, Classes, Working with Instances, Techniques for Designing Classes, Inheritance, Polymorphism. **GUI Programming:** Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

#### **Text Book:**

Tony Gaddis, Starting Out With Python (3e)

#### **References**

1. Kenneth A. Lambert, Fundamentals of Python
2. Clinton W. Brownley, Foundations for Analytics with Python
3. James Payne, Beginning Python using Python 2.6 and Python 3
4. Charles Dierach, Introduction to Computer Science using Python
5. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3

<b>MSCCS214 (elective) (A)</b>	<b>PHP PROGRAMMING</b>		<b>PP</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>	

### **UNIT - I**

HTML- Basic HTML Tags, The document body, Text, Hyperlinks, Lists, Images, Tables, Frames, Forms- Toward Interactivity. CASCADING STYLE SHEETS – Introduction, using Inline Styles, Defining Your Own Styles; Properties in Values in Styles; Embedded Style Sheets, Linking external sheets;

### **UNIT - II**

INTRODUCTION TO JAVASCRIPT- JavaScript, Basics, Variables, Statements, Obtaining User Input with prompt dialog boxes, FUNCTIONS – function definition; User defined functions; program modules in JavaScript; scope rules, global functions, Recursion; OBJECTS IN JAVA SCRIPT – Math Object, String Object, Date Object, Boolean and Number Object, document and window Objects. EVENTS - onclick, onchange, onload, onerror, onmouseover, onmouseout, onselect, onfocus, onblur, onsubmit, onunload.

### **UNIT - III**

Essential PHP, Operators and Flow Control, Strings and arrays, Creating Function, (Chapter 1, 2, 3, 4)

### **UNIT - IV**

Reading Data in Web Pages, File Handling, working with Databases, Sessions, Cookies and FTP

**(Chapter 5, 9, 10, 11)**

### **TEXT BOOKS**

1. Internet & World Wide Web- H. M. Deitel, P.J. Deitel, A. B. Goldberg-Third Edition.
2. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007.
3. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley India Private Limited, 2008.

<b>MSCCS214 (elective) (B)</b>	<b>PROGRAMMING WITH R</b>	<b>DAR</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **Unit I**

Introduction- What Is R?, Installing R, Choosing an IDE, Your First Program, Installing Extra Related Software, Scientific Calculator- Mathematical Operations and Vectors, Assigning Variables, Special Numbers, Logical Vectors; Inspecting Variables- Classes, Different Types of Numbers, Other Common Classes, Checking and Changing Classes, Examining Variables, Workspace

### **Unit II**

Vectors, Matrices, and Arrays; Lists and Data Frames-Lists, NULL, Pairlists, Data Frames; Environments and Functions

### **Unit III**

Strings and Factors, Flow Control and Loops, Advanced Looping; Packages- Loading Packages, Installing Packages, Maintaining Packages; Dates and Times-Date and Time Classes, Conversion to and from Strings, Time Zones, Arithmetic with Dates and Times, Lubridate.

### **Unit IV**

Getting Data-Built-in Datasets, Reading Text Files, Reading Binary Files, Web Data, Accessing Databases; Cleaning and Transforming- Cleaning Strings, Manipulating Data Frames, Sorting, Functional Programming; Exploring and Visualizing- Summary Statistics, Three Plotting Systems, Scatterplots, Line Plots, Histograms, Box Plots, Bar Charts, Other Plotting Packages and Systems

### **TEXT BOOK:**

1. Richard cotton "A step-by-step function guide to data analysis: Learning R" First edition, O'REILLY, 2013

### **REFERENCES**

1. Michael J. Crawley "The R Book" Second Edition A John Wiley & Sons, Ltd., Publication, 2013.
2. Garrett Golemund "Hands-On Programming with R" First Edition, O'Reilly Media, 2014
3. Roger D. Peng "R Programming for Data Science" Leanpub, 2014-15.



<b>MSCCS215</b>	<b>DATA MINING LABORATORY</b>		<b>DML</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>	

Weka is a collection of machine learning algorithms for data mining tasks. The algorithms can either be applied directly to a datasets#. Weka contains tools for data pre-processing, classification, regression, clustering, association rules, and visualization.

Launching WEKA, COMMAND-LINE(simple CLI), EXPLORER-User Interface, Preprocessing, Classification, Clustering, Associating, Selecting Attributes, Visualizing; EXPERIMENTER-Simple, Advanced; KNOWLEDGEFLOW-Introduction, Features, Components; ArffViewer; Converters;etc.,

### RESOURCES:

Manuals and Software:

- <http://www.cs.waikato.ac.nz/ml/weka/index.html>
- Collections of Datasets:
- # <http://www.cs.waikato.ac.nz/ml/weka/datasets.html>

<b>MSCCS216</b> <b>ELECTIVE- 1 ( A)</b>	<b>.NET PROGRAMMING LABORATORY</b>		<b>.NETL</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>	

- The concepts covered in the corresponding theory paper are to be implemented.

<b>MSCCS216</b> <b>ELECTIVE-1 (B)</b>	<b>PYTHON PROGRAMMING LABORATORY</b>		<b>PPL</b>
<b>WORK LOAD: 4 PPW</b>	<b>REVIEW ASSESSMENT</b>	<b>EXTERNAL MARKS: 50</b>	

- The concepts covered in the corresponding theory paper are to be implemented.

<b>MSCCS217</b> <b>ELECTIVE-2 ( A)</b>	<b>PHP PROGRAMMING LABORATORY</b>		<b>PHPL</b>
<b>WORK LOAD: 0 4</b>	<b>INTERNAL MARKS: 00</b>	<b>EXTERNAL MARKS: 50</b>	

- The concepts covered in the corresponding theory paper are to be implemented.

<b>MSCCS217 ELECTIVE-2 (B)L</b>	<b>PROGRAMMING WITH R LABORATORY</b>	<b>PRL</b>
<b>WORK LOAD: 0 4</b>	<b>INTERNAL MARKS: 00</b>	<b>EXTERNAL MARKS: 50</b>

- The concepts covered in the corresponding theory paper are to be implemented.

<b>MSCCS218</b>	<b>SEMINAR</b>	<b>S</b>
<b>WORK LOAD: 0 2</b>	<b>INTERNAL MARKS: 25</b>	<b>EXTERNAL MARKS: 00</b>

- This course is meant to give students practice of speaking in front of an audience and to explore topics of their own choosing in detail.
- Students have to search topics and organize presentations for faculty and other students. The topics may be any aspect of the Computer science and must be approved by the instructor in advance.
- To improve students speaking skills, each student has to receive feedback from the fellow students and the instructor.

**Expectations:**

- Attendance at each seminar is mandatory for all students enrolled.
- In addition, students are expected to attend all other seminars in the department, such as invited guest speakers. It is expected that students will actively participate by asking questions of the speaker.
- The effort by students to meet these expectations will be considered in the determination of your final grade.

**M.SC. II YEAR II SEMESTER:**

Paper No	Paper Title/Subject	Workload Per Week (Theory & Lab)	Marks			CREDITS
			Internal	External	Total	
MSCCS221	ARTIFICIAL INTELLIGENCE	04	20		100	4
MSCCS222	a) CRYPTOGRAPHY AND NET WORK SECURITY b) MOBILE COMPUTING	04	20		100	4
MSCCS223	a) BIG DATA ANALYTICS b) CLOUD COMPUTING	04	20		100	4
MSCCS224	MAJOR PROJECT	--	75	175	250	10
MSCCS225	COMPREHENSIVE VIVA	--	00	75	75	3
	SEMINAR	--	25	00	25	1
					650	26

<b>MSCCS221</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>AI</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

**Unit I:**

Concepts in AI, problem solving in AI, Defining an AI Problem as state space search, production systems, AI problem characteristics. Search techniques: Breadth first search, depth first search.

**Unit II:**

**Heuristic Search Techniques:** Generate and test, hill climbing, best first search, Heuristic function applications, problem Reduction, simulated annealing.

**Knowledge Representation in AI:** knowledge representations approaches & issues in knowledge representation, Knowledge Representation using predicate logic, forward and backward reasoning, semantic nets, frames, scripts & conceptual Dependency.

**Unit III:**

**Game Playing:** The Minimax Search procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening.

**Expert systems:** Architecture, the knowledge base, inference engine, Knowledge acquisition Expert system development process MYCIN as an example. Types of Expert Systems – Rule Based, Case Based, Model Based

**Reasoning in Uncertain Situations:** Introduction to Non monotonic Reasoning, Logic-Based Abductive Inference

**Unit IV:**

**Uncertainty Measures:** Stochastic Approach to Uncertainty, Bayesian Belief Networks, Certainty Factor Theory, Dempster – Shafer Theory.

**Machine Learning:** Machine learning Systems, Supervised and unsupervised learning , Inductive Learning and Deductive Learning .

**Artificial Neural Networks:** Introduction, Single Layer and Multilayer Feed Forward Networks, Radial Basis Function, and Design Issues of ANN.

**Text Books:**

1. E. Rich and Knight, "Artificial Intelligence", 3<sup>rd</sup> Edition, 2009, TMH.
2. S. J. Russel and P. Norvig, "Artificial Intelligence: A Modern Approaches", Prentice Hall.
3. George F Luger, "Artificial Intelligence", Fourth Edition, Pearson Education Asia, ISBN No: 81-7808-491-0.

<b>MSCCS222 ELECTIVE-3 (A)</b>	<b>CRPTOGRAPHY AND NETWORK SECURITY</b>	<b>CNS</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

#### **UNIT - I**

INTRODUCTION:- Attacks, Services, and Mechanisms, Security Services.

CONVENTIONAL ENCRYPTION: CLASSICAL TECHNIQUES: Steganography, Classical Encryption Techniques. CONVENTIONAL ENCRYPTION: MODERN TECHNIQUES:- Simplified DES. The Data Encryption Standard, Differential and Linear Cryptanalysis, Block Cipher Modes of Operation.

#### **UNIT - II**

CONFIDENTIALITY USING CONVENTIONAL ENCRYPTION:- Traffic Confidentiality, Random Number Generation. PUBLIC-KEY CRPTOGRAPHY:- Principles of Public-Key Cryptosystems, The RSA Algorithm, DiffieHellman Key Exchange, Elliptic Curve Cryptography. INTRODUCTION TO NUMBER THEORY:- Prime and Relatively Prime Numbers, Fermat's and Euler's Theorem, Euclid's Algorithm, The Chinese Remainder Theorem, Discrete Logarithms.

#### **UNIT - III**

MESSAGE AUTHENTICATION AND HASHFUNCTIONS:- AuthenticationRequirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs. DIGITAL SIGNATURES AND AUTHENTICATION PROTOCOLS:- Digital Signatures, Authentication Protocols, Digital Signature Standard.

#### **UNIT - IV**

ELECTRONIC MAIL SECURITY: S/MIME. IP SECURITY: IP Security Overview, IP Security Architecture, Encapsulating Security Payload, Key Management. FIREWALLS: Firewall Design Principles, Trusted Systems. (Chapters 1,2,4,5,6,7,8,10,12,13 and 16)

#### **TEXT BOOK:**

1. Cryptography and Network Security principles and Practice FOURTH Edition By William Stallings (Pearson Asia)

#### **REFERENCE BOOKS:**

1. Davies &Price: Security For Computer Networks - Wiley (1984)
2. Mayer &Matyas: Cryptography - Wiley B. Schneier: Applied Cryptography - (John Wiley)

<b>MSCCS222 ELECTIVE-3 (B)</b>	<b>MOBILE COMMUNICATIONS</b>	<b>MC</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **UNIT I**

Introduction to Mobile Communications and Computing: Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture's : Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services. (Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

### **UNIT II**

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP). Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/ fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

### **UNIT III**

Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues. Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

### **UNIT IV**

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs. Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and Treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

### **TEXT BOOK:**

1. Jochen Schiller, "Mobile Communications", Addison-Wesley. (Chapters: 4, 7, 9, 10, 11), second edition, 2004.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002 (Chapters 11, 15, 17, 26 and 27)

### **REFERENCE BOOKS**

1. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional, 2005.

<b>MSCCS223 ELECTIVE-4 (A)</b>	<b>BIG DATA ANALYTICS</b>		<b>BDA</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>	

### **UNIT I**

Introduction to Big Data- Introduction, Big Data, Defining Big Data, Why Big Data and why now, Big Data example, Working with Big Data- Introduction, Data explosion, Data volume, Data velocity, Data variety, Big Data Processing Architectures- Introduction, Data processing revisited, Data processing techniques, Data processing infrastructure challenges, Shared-everything and shared-nothing architectures, Big Data processing, Telco Big Data study.

### **UNIT II**

Introducing Big Data Technologies- Introduction, Distributed data processing, Big Data processing requirements, Technologies for Big Data processing, Hadoop, NoSQL, Textual ETL processing, Data Warehousing Revisited- Introduction, Traditional data warehousing, or data warehousing 1.0, Data warehouse 2.0, Reengineering the Data Warehouse- Introduction, Enterprise data warehouse platform, Choices for reengineering the data warehouse, Modernizing the data warehouse, Case study of data warehouse modernization.

### **UNIT III**

New Technologies Applied to Data Warehouse- Introduction, Data warehouse challenges revisited, Data warehouse appliance; Cloud computing, Data virtualization, Integration of Big Data and Data Warehousing- Introduction, Components of the new data warehouse, Integration strategies, Hadoop & RDBMS, Big Data appliances, Data virtualization, Semantic framework. Data-Driven Architecture for Big Data- Introduction, Metadata, Master data management, Processing data in the data warehouse, Processing complexity of Big Data, Machine learning,

### **UNIT IV**

Information Management and Life Cycle for Big Data- Introduction, Information life-cycle management, Information life-cycle management for Big Data, Big Data Analytics, Visualization, and Data Scientists- Introduction, Big Data analytics, Data discovery, Visualization, The evolving role of data scientists, Implementing the Big Data – Data Warehouse – Real-Life Situations- Introduction, building the Big Data – Data Warehouse, Customer-centric business transformation, Hadoop and MySQL drives innovation, Integrating Big Data into the data warehouse.

### **Text book:**

1. Data Warehousing in the Age of Big Data by Krish Krishnan, Morgan Kaufmann.

### **REFERENCES**

1. chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
2. J Berman, “Principles of Big Data Preparing, Sharing, and Analyzing Complex Information”, 1 st Edition, published by Morgan Kaufmann
3. David Loshin, “Big Data Analytics - From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph” , Morgan Kaufmann
4. Soumendra Mohanty , “Big Data Imperatives: Enterprise 'big Data' Warehouse, 'BI' Implementations and Analytics, Apress.
5. Peter Zadrozny , Raghu Kodali ,”Big Data Analytics Using Splunk”, Apress 2013

<b>MSCCS223 ELECTIVE-4 (B)</b>	<b>CLOUD COMPUTING</b>	<b>CC</b>
<b>WORK LOAD: 4 PPW</b>	<b>INTERNAL MARKS: 20</b>	<b>EXTERNAL MARKS: 80</b>

### **UNIT I**

Cloud Computing Basics-Overview, Applications, Intranets and the Cloud. Your Organization and Cloud Computing- Benefits, Limitations, Security Concerns. Hardware and Infrastructure- Clients, Security, Network, Services. Software as a Service (SaaS)- Understanding the Multitenant Nature of SaaS Solutions, Understanding SOA.

### **UNIT II**

Platform as a Service (PaaS)-IT Evolution Leading to the Cloud, Benefits of PaaS Solutions, Disadvantages 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 within an IaaS Solution. Identity as a Service (IDaaS)- Understanding Single Sign-On (SSO), OpenID, Mobile ID Management. Cloud Storage-Overview, Cloud Storage Providers.

### **UNIT III**

Virtualization-Understanding Virtualization, History, Leveraging Blade Servers, Server Virtualization, Data Storage Virtualization. Securing the Cloud- General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats, Service Oriented Architecture-Understanding SOA, Web Services Are Not Web Pages, Understanding Web Service Performance, Web Service and Reuse, Web Service and Interoperability.

### **UNIT IV**

Developing Applications-Google, Microsoft, Cast Iron Cloud, Bungee Connect, Development. Migrating to the Cloud-Cloud Services for Individuals, Cloud Services Aimed at the Mid-Market, Enterprise-Class Cloud Offerings, and Migration. Coding Cloud Based Applications-Creating a Mashup using Yahoo Pipe, Using Google App Engine and creating a Windows Azure "Hello, World" Application. Application Scalability-Load-Balancing Process, Designing for Scalability, Capacity Planning Versus Scalability, Scalability and Diminishing Returns and Performance Tuning.

#### **Text Books:**

1. Cloud Computing: A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 2010 by the McGraw-Hill.
2. Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more. By Dr. Kris Jamsa.

#### **References:**

1. Cloud Computing Bible by Barrie Sosinsky, Published by Wiley Publishing, 2011.
2. Cloud Computing for Dummies by Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Dr. Fern Halper, Wiley Publishing, 2010.
3. Moving to the Cloud, Dinakar Sitaram, Elsevier, 2014.



<b>MSCCS224</b>	<b>MAJOR PROJECT</b>		<b>MP</b>
<b>WORK LOAD: 0 0</b>	<b>INTERNAL MARKS: 75</b>	<b>EXTERNAL MARKS: 175</b>	

The Project work constitutes a major component in most professional programmes. It needs to be carried out with due care, and should be executed with seriousness by the students. The project work is not only a partial fulfilment of the MSC requirements, but also provide a mechanism to demonstrate ASK (Attitude, Skills, and Knowledge) with specialisation. The project work should compulsorily include the software development. Physical installations/configuring of LAN/WAN or theoretical projects or study of the systems, which doesn't involve s/w development, *ARE STRICTLY NOT ALLOWED*.

The students are expected to work on a real-life project preferably in some industry/ R&D Laboratories / Educational Institution / Software Company. Students are encouraged to work in their interested area. The student can formulate a project problem with the help of his / her Guide of the concerned college. APPROVAL OF THE PROJECT PROPOSAL IS MANDATORY by his/her Guide. If approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project. Project problem domain selected and the specifications should be genuine.

<b>MSCCS225</b>	<b>COMPREHENSIVE VIVA</b>		<b>CV</b>
<b>WORK LOAD: 0 0</b>	<b>INTERNAL MARKS: 00</b>	<b>EXTERNAL MARKS: 50</b>	

- Conducting Comprehensive viva-voce to test the overall understanding on the various fields related to Computer Science and allied subjects.
- Most important is, need to be aware of the entire syllabus of computer science right from your first year. Be thorough with at least the content in that particular subject; recall all the units and prepare for probable questions.

<b>MSCCS225</b>	<b>SEMINAR</b>		<b>S</b>
<b>WORK LOAD: 0 2</b>	<b>INTERNAL MARKS: 25</b>	<b>EXTERNAL MARKS: 00</b>	

- This course is meant to give students practice of speaking in front of an audience and to explore topics of their own choosing in detail.
- Students have to search topics and organize presentations for faculty and other students. The topics may be any aspect of the Computer science and must be approved by the instructor in advance.
- To improve students speaking skills, each student has to receive feedback from the fellow students and the instructor.

**Expectations:**

- Attendance at each seminar is mandatory for all students enrolled.
- In addition, students are expected to attend all other seminars in the department, such as invited guest speakers. It is expected that students will actively participate by asking questions of the speaker.
- The effort by students to meet these expectations will be considered in the determination of your final grade.