MANGALORE UNIVERSITY

Scheme of Examination and Syllabus for

Master of Science in Information Systems Degree Programme

Choice Based Credit System (CBCS) (2016-17 onwards)

DEPARTMENT OF POST-GRADUATE STUDIES AND RESEARCH IN COMPUTER SCIENCE
MANGALAGANGOTRI-574 199

JULY 2016

I SEMESTER M.Sc. Information System								
Subject Code	Subjects	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
HARD CORE								
ISH401	Mathematical Foundations of Computer Science	4L	-	3	30	70	100	4
ISH402	Advances in Computer Architecture	4L	-	3	30	70	100	4
ISH403	Advanced Data Structures	4L	-	3	30	70	100	4
ISH404	Advances in Operating Systems	4L	-	3	30	70	100	4
SOFT CORE								
SIS405	Java Programming	4L	-	3	30	70	100	4
SIP406	Advanced Data Structure Lab	-	6	3	30	70	100	3
SIP407	Java Technology Lab	-	6	3	30	70	100	3
	Total Semester	20	12	21	210	490	700	26

L:Lecture, P:Practical, T: Tutorials

II SEMESTER M.Sc. Information System								
Subject Code	Subjects	Theory Hours/ Week	Practical Hours/ Week	Duration of exams(Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
HARD CORE								
ISH451	Advanced Computer Networks	4L	-	3	30	70	100	4
ISH 452	Advances in Data Base Management Systems	4L	-	3	30	70	100	4
ISH 453	Software Engineering Methodologies	4L	-	3	30	70	100	4
SOFT CORE								
ISS 454 ISS 455 ISS 456 ISS 457 ISS 458	Decision Support Systems Information Mining Pattern Recognition OOOD & UML Soft Computing Paradigms	4L	-	3	30	70	100	4
ISP 459 ISP 460 ISP 461	DBMS Lab Information Mining Lab Pattern Recognition Lab	---	6	3	30	70	100	3
ISP 462 ISP 463 ISP 464	Software Engineering Lb UML Modeling Lab Soft-Computing Paradigms Lab	---	6	3	30	70	100	3
OPEN ELECTIVE								
ISE 465 ISE 466	Data Mining Techniques Web Technologies	3L	--	3	30	70	100	3*
	Total Semester	19	12	21	210	490	700	22+3*

L:Lecture, P:Practical, T: Tutorials
*** Not included for CGPA.**

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III SEMESTER M.Sc. Information System								
Subject Code	Course	Theory Hours / Week	Practical Hours / Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
HARD CORE								
ISH 501	Computer Graphics And Multimedia	4L	-	3	30	70	100	4
ISH 502	.Net Technologies	4L	-	3	30	70	100	4
ISH 503	Information Storage and Management	4L	-	3	30	70	100	4
SOFT CORE								
ISS 504 ISS 505 ISS 506 ISS 507 ISS 508	Information Retrieval System Data Science Methods Information Retrieval and Web Mining Distributed Computing Systems Android Application Programming	4L	-	3	30	70	100	4
ISP 509 ISP 510 ISP 511	Computer Graphics Lab Information Retrieval System Lab Data Science Methods Lab	---	6	3	30	70	100	3
ISP 512 ISP 513 ISP 514	NET Programming Lab Distributed Computing Systems Lab Android Application Programming Lab	---	6	3	30	70	100	3
OPEN ELECTIVE								
ISE 515 ISE 516	Open Source Software Tools Mobile E-Commerce	3L		3	30	70	100	3*
	Total	19	12	21	210	490	700	22+3*

*** Not included for CGPA.**

IV SEMESTER M.Sc .Information System							
Subject Code	Subject	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
				IA	Dissertation+ Viva Exam	Total	Credits
ISP 551	Project Work Report Viva-Voce	32	-	120	280 (Report : 180 Viva-Voce: 100)	400	16
Total Marks off I Semester						700	26
Total Marks off II Semester						700	22+3*
Total Marks off III Semester						700	22+3*
Total Marks of IV Semester						400	16
Grand Total Credits of all The Four Semesters						2500	86+6*

Project Work at Software Company / University/ National Institute

Hard core Credits: **16 + 12+12+16 = 56 (60.87%)**

Total Soft-Core Credits: **10 +10+10 = 30 (32.60%)**

Open Elective Credits: **03* +0 3* = 06 (6.52%)**

***Not included for CGPA.**

I SEMESTER M.Sc. Information System								
Subject Code	Subjects	Theory Hours/ Week	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
HARD CORE								
ISH401	Mathematical Foundations of Computer Science	4L	-	3	30	70	100	4
ISH402	Advances in Computer Architecture	4L	-	3	30	70	100	4
ISH403	Advanced Data Structures	4L	-	3	30	70	100	4
ISH404	Advances in Operating Systems	4L	-	3	30	70	100	4
SOFT CORE								
SIS405	Java Programming	4L	-	3	30	70	100	4
SIP406	Advanced Data Structure Lab	-	6	3	30	70	100	3
SIP407	Java Technology Lab	-	6	3	30	70	100	3
	Total Semester	20	12	21	210	490	700	26

L:Lecture, P:Practical, T: Tutorials

ISH 101: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Introduction : Mathematical notions and terminology of sets, seque nces and tuples, functions and relations, graphs, strings and langua ges, Boolean logic – properties and representation, Definition, Theorems and Types of Proofs – Formal proofs, deductive, reduction to definition, proof by construction, contradiction, induction, counter-examples.

Regular Languages : Finite automata, DFA, NFA, Equivalence of DFA & NFA . An application, Regular expressions and languages, applications.

UNIT-II **12 Hrs.**

Context – free languages : CFGs, Applications, Ambiguity removal, pushdown automata and Equivalence with CFGs**.** **Turing Machine :** Turing machines, variants of TMs, programming techniques for TMs, Restricted TMs, TMs and Computers.

Decidability : Decidable languages, decidable problems concerning Context free languages, The halting problem – Diagonalization method, halting problem is undecidable. **Reducibility :** Undecidable problems from language theory – Regular expressions, Turing machines, Reduction. A simple undecidable problem (PCP), mapping reducibility, and other undecidable problems.

UNIT-III **12 Hrs.**

Decidability : Decidable languages, decidable problems concerning Context free languages, The halting problem – Diagonalization method, halting problem is undecidable.
Reducibility : Undecidable problems from language theory – Regular expressions, Turing machines, Reduction. A simple undecidable problem (PCP), mapping reducibility, and other undecidable problems.

UNIT-IV **12 Hrs.**

Computability : Primitive recursive functions, computable functions , examples, the recursion theorem. **Computational Complexity :** Tractable and Intractable problems – Growth rates of function, time complexity of TM, tractable decision problems, theory of Optimization.

REFERENCE BOOKS:

1. Michael Sipser,Introduction to Theory of Computation, Thompson Brooks ,1997.
2. J.E. Hopcroft, Rajeev, Introduction To Automata Theory, Languages And C Computations, 3rd Edition, Pearson Education, India.
3. John C. Martin, ,Introduction to languages and theory of computation, McGraw-Hill, 2003.
4. J.P. Tremblay and R. Manohar,Discrete Mathematical structures with application to Computer Science McGraw-Hill, 01-Sep-1987.
5. E. V. Krishnamoorthy,Theory of Computer Science, Springer-Verlag, 1985

ISH 102: ADVANCES IN COMPUTER ARCHITECTURE

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Introduction and Review of Fundamentals of Computer Design: Introduction; Classes computers; Defining computer architecture; Trends in Technology; Trends in power in Integrated Circuits; Trends in cost; Dependability, Measuring, reporting and summarizing Performance; Quantitative Principles of computer design; Performance and Price-Performance; Fallacies and pitfalls; Case studies. Some topics in Pipelining, Instruction –Level Parallelism, Its Exploitation and Limits on ILP: Introduction to pipelining, ILP; Crosscutting issues, fallacies, and pitfalls with respect to pipelining; Basic concepts and challenges of ILP; Case study of Pentium Fallacies and pitfalls. Introduction to limits in ILP; Performance and efficiency in advanced multiple-issue processors.

UNIT-II **12 Hrs.**

Memory Hierarchy Design, Storage Systems: Review of basic concepts; Crosscutting issues in the design of memory hierarchies; Case study of AMD Opteron memory hierarchy; Fallacies and pitfalls in the design of memory hierarchies. Introduction to Storage Systems; Advanced topics in disk storage; Definition and examples of real faults and failures; I/O performance, reliability measures, and benchmarks; Queuing theory; Crosscutting issues; Designing and evaluating an I/O system – The Internet archive cluster; Case study of NetAA FAS6000 filer; Fallacies and pitfalls.

UNIT-III **12 Hrs.**

Hardware and Software for VLIW and EPIC Introduction: Exploiting Instruction-Level Parallelism Statically, Detecting and Enhancing Loop-Level Parallelism, Scheduling and Structuring Code for Parallelism, Hardware Support for Exposing Parallelism: Predicated Instructions, Hardware Support for Compiler Speculation, The Intel IA-64 Architecture and Itanium Processor, Concluding Remarks.

UNIT-IV **12 Hrs.**

Large-Scale Multiprocessors and Scientific Applications Introduction, Interprocessor Communication: The Critical Performance Issue, Characteristics of Scientific Applications, Synchronization: Scaling Up, Performance of Scientific Applications on Shared-Memory Multiprocessors, Performance Measurement of Parallel Processors with Scientific Applications, Implementing Cache Coherence, The Custom Cluster Approach: Blue Gene/L, Concluding Remarks.

Computer Arithmetic Introduction, Basic Techniques of Integer Arithmetic, Floating Point, Floating-Point Multiplication, Floating-Point Addition, Division and Remainder, More on Floating-Point Arithmetic, Speeding Up Integer Addition, Speeding Up Integer Multiplication and Division, Fallacies and Pitfalls.

REFERENCE BOOKS:

1. Hennessey and Patterson: “Computer Architecture A Quantitative Approach”, 4th Edition, Elsevier, 2007.
2. Kai Hwang: Advanced Computer Architecture - Parallelism, Scalability, Programmability, 2nd Edition, Tata McGraw Hill, 2010.

ISH 103: ADVANCED DATA STRUCURES

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

ROLE OF ALGORITHMS IN COMPUTING : Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method.

HIERARCHICAL DATA STRUCTURES : Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion- B-Trees: Definition of Btrees – Basic operations on B-Trees – Deleting a key from a B-Tree- Binomial Heaps: Binomial Trees and Binomial Heaps – Operations on Binomial Heaps .

UNIT-II **12 Hrs.**

GRAPHS & STRINGS : Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; AllPairs

Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm; Maximum Flow: Flow Networks – The Ford-Fulkerson method – Maximum Bipartite Matching; String Matching: The Native String-Matching Algorithm – The Knuth-Morris-Pratt Algorithm .

UNIT-III **12 Hrs.**

ALGORITHM DESIGN TECHNIQUES : Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy – Huffman Codes.

UNIT-IV **12 Hrs.**

NP COMPLETE AND NP HARD : NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP-Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems.

REFERENCE BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Prentice-Hall.
2. Robert Sedgewick and Kevin Wayne, "Algorithms", Fourth Edition, Pearson Education.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
4. Donald E Knuth, "Art of Computer Programming-Volume I- Fundamental Algorithms", Third edition, Addison Wesley, 1997.

ISH 104: ADVANCES IN OPERATING SYSTEMS

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Operating System Overview : Operating System Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments Leading to Modern Operating Systems, Microsoft Windows Overview, Traditional UNIX Systems, Modern UNIX Systems, Linux. **Process description & control :** What is a Process?, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues, UNIX SVR4 Process Management.

UNIT-II **12 Hrs.**

Threads, SMP, and Microkernel: Processes and Threads, Symmetric Multiprocessing (SMP), Microkernels, Windows Vista Thread and SMP Management, Solaris Thread and SMP Management, Linux Process and Thread Management..
Virtual Memory : Hardware and Control Structures, Operating System Software, UNIX and Solaris Memory Management, Linux Memory Management, Windows Vista Memory Management, Summary.

UNIT-III **12 Hrs.**

Multiprocessor and Real-Time Scheduling: Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclsSl) Scheduling, Windows Vista Scheduling.
Distributed Process Management: Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock. **Security:** Security Threats, Attacks, and Assets, Intruders, Malicious Software Overview, Viruses, Worms, and Bots, Rootkits

UNIT-IV **12 Hrs.**

Kernel Organization: Using Kernel Services, Daemons, Starting the Kernel, Control in the Machine, Modules and Device Management, Module Organization, Module Installation and Removal, Process and Resource Management, Running Process Manager, Creating a new Task, IPC and Synchronization, The Scheduler, Memory Manager, The Virtual Address Space, The Page Fault Handler, File Management.
The windows NT/2000/XP kernel: Introduction, The NT kernel, Objects, Threads, Multiplication Synchronization, Traps, Interrupts and Exceptions, The NT executive , Object Manager, Process and Thread Manager, Virtual Memory Manager, I/o Manager, The cache Manager , Kernel local procedure calls and IPC, The native API, subsystems.

REFERENCE BOOKS:

1. William Stallings: Operating Systems: Internals and Design Principles, 6th Edition, Prentice Hall, 2013.
2. Gary Nutt: Operating Systems, 3rd Edition, Pearson, 2014.
3. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008
4. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3rd Edition, Prentice Hall, 2006.
5. Pradeep K Sinha: Distributed Operating Systems, Concept and Design, PHI, 2007.

ISS 105: JAVA PROGRAMMIMG

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

INTRODUCTION TO JAVA: Java and Java applications; Java Development Kit (JDK); Java is interpreter, Byte Code, JVM; Object-oriented programming; Simple Java programs. Data types and other tokens; Creating and destroying objects; Access specifies; Operators and Expressions; Control Statements: Selection statements, iteration statements, Jump Statements.

12 Hrs.

UNIT-II

CLASSES, INHERITANCE, EXCEPTIONS, APPLETS: Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes. Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading. Exception handling**:** Exception handling in Java. The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument(); The AudioClip Interface; The AppletStub Interface; Output to the Console

12 Hrs.

UNIT-III

MULTI THREADED PROGRAMMING, EVENT HANDLING: Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems. Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes.

UNIT-IV **12 Hrs.**

SWINGS: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable.

JAVA 2 ENTERPRISE EDITION OVERVIEW, DATABASE ACCESS: Overview of J2EE and J2SE. The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.

REFERENCE BOOKS:

1. Herbert Schildt, **,Java - The Complete Reference,** 7th Edition, Tata Mcgraw Hill, 2007.
   Jim Keogh, **J2EE - The Complete Reference,** Tata Mcgraw Hill, 2007.
2. Y. Daniel Liang, **Introduction to JAVA Programming,** 6th Edition, Pearson Education, 2007.
3. Stephanie Bodoff et al, **The J2EE Tutorial,** 2nd Edition, Pearson Education, 2004

ISP-106: ADVANCED DATA STRUCTURE LAB

ISP-107: JAVA TECHNOLOGY LAB

II SEMESTER M.Sc. Information System								
Subject Code	Subjects	Theory Hours/ Week	Practical Hours/ Week	Duration of exams(Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
HARD CORE								
ISH451	Advanced Computer Networks	4L	-	3	30	70	100	4
ISH 452	Advances in Data Base Management Systems	4L	-	3	30	70	100	4
ISH 453	Software Engineering Methodologies	4L	-	3	30	70	100	4
SOFT CORE								
ISS 454 ISS 455 ISS 456 ISS 457 ISS 458	Decision Support Systems Information Mining Pattern Recognition OOOD & UML Soft Computing Paradigms	4L	-	3	30	70	100	4
ISP 459 ISP 460 ISP 461	DBMS Lab Information Mining Lab Pattern Recognition Lab	---	6	3	30	70	100	3
ISP 462 ISP 463 ISP 464	Software Engineering Lb UML Modeling Lab Soft-Computing Paradigms Lab	---	6	3	30	70	100	3
OPEN ELECTIVE								
ISE 465 ISE 466	Data Mining Techniques Web Technologies	3L	--	3	30	70	100	3*
	Total Semester	19	12	21	210	490	700	22+3*

L: Lecture, P: Practical, T : Tutorials

*** Not included for CGPA**

ISH 451: ADVANCED COMPUTER NETWORKS

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Review of Networking Concepts: MAC layer issues, Ethernet 802.3, ARP, IP addressing and Subnetting, NAT and PAT, Variable Length Subnet Masking, CIDR

UNIT-II **12 Hrs.**

End to End protocols (10) TCP connection establishment and termination, Sliding window concepts, other issues: wraparound, silly window syndrome, Nagle's algorithm, adaptive retransmission, TCP extensions. Congestion and flow control, Queuing theory, TCP flavors: Tahoe, Reno, New-Reno, TCP-SACK, TCP-RED and TCP-Vegas.Transport protocol for real time (RTP), Quality of service: Integrated Services, Differentiated services

UNIT-III **12 Hrs.**

Routing and Multicast: Structure of internet: Autonomous systems, Intra-domain routing: OSPF and RIP, Inter-domain routing: BGP. Multicasting: Group Management (IGMP), Internet scale multicasting: Reverse path broadcast, MOSPF, DVMPRP, PIM.

UNIT-IV **12 Hrs.**

Peer to peer and overlay networks: Concept of overlays, Unstructured Overlays: Gnutella, Concepts of Distributed Hash Table, Structured Overlays: Chord, CAN, Pastry.

REFERENCE BOOKS:

1. Peterson and Davie,, Computer Networks: A Systems Approach5th Ed. Morgan Kauffman, 2011
2. Kurose and Ross, Computer Networking: Top Down Approach, 6th Ed. Pearson, 2011.

ISH 452: ADVANCES IN DATA BASE MANAGEMENT SYSTEMS

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas; Update operations, transactions and dealing with constraint violations. Overview of Object-Oriented Concepts – Objects, Encapsulation, Polymorphism, Type and class hierarchies etc.

UNIT-II **12 Hrs.**

Object and Object-Relational Databases: Object Oriented Concepts: – Objects, complex objects; Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Overview of C++ language binding; Conceptual design of Object database. Overview of object relational features of SQL; Object-relational features of Oracle; Implementation and related issues for extended type systems; The nested relational model.

UNIT-III **12 Hrs**
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Parallel and Distributed Databases: Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations; Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS; Distributed catalog management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery.

UNIT-IV **12 Hrs.**

Data Warehousing, Decision Support and Data Mining: Introduction to decision support; OLAP, multidimensional model; Window queries in SQL; Finding answers quickly; Implementation techniques for OLAP; Data Warehousing; Views and Decision support, View materialization, Maintaining materialized views. Introduction to Data Mining; Counting co-occurrences; Mining for rules; Tree-structured rules; Clustering; Similarity search over sequences; Incremental mining and data streams; Additional data mining tasks.

Introduction to Enhanced Data Models for Some Advanced Applications: Active database concepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.

REFERENCE BOOKS:

1. Elmasri and Navathe: Fundamentals of Database Systems, Pearson Education, 2013.
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2013.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition, McGraw Hill, 2010.

ISH 453: SOFTWARE ENGINEERING METHODOLOGIES

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

SOFTWARE PRODUCT AND PROCESS: Introduction – S/W Engineering Paradigm – Verification – Validation – Life Cycle Models – Component Based Design - System Engineering – Business Process Engineering Overview – Product Engineering Overview – Agile Methods – Open Source Software Development - Crowd Sourcing.

SOFTWARE REQUIREMENTS: Systems Engineering - Analysis Concepts - Functional and Non-Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data – Functional and Behavioral Models – Structured Analysis and Data Dictionary

UNIT-II **12 Hrs.**

DESIGN CONCEPTS AND PRINCIPLES: Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Real Time Software Design – System Design – Real Time Executives – Data Acquisition System – Monitoring And Control System.

UNIT-III **12 Hrs.**

Taxonomy of Software Testing – Types of S/W Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based on Data Flow Mechanisms – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques.

UNIT-IV **12 Hrs.**

SOFTWARE PROJECT MANAGEMENT: Measures and Measurements – ZIPF's Law – Software Cost Estimation – Function Point Models – COCOMO Model – Delphi Method – Scheduling – Earned Value Analysis – Error Tracking – Software Configuration Management – Program Evolution Dynamics – Software Maintenance – Project Planning – Project Scheduling– Risk Management – CASE Tools.

REFERENCE BOOKS:

1. Ian Sommerville, "Software engineering", Ninth Edition, Pearson Education Asia, 2010.
2. Roger S. Pressman, "Software Engineering – A practitioner's Approach", Seventh Edition, Tata McGraw-Hill International Edition, 2009.
3. Watts S.Humphrey,"A Discipline for Software Engineering", Pearson Education, 2008.
4. James F.Peters and Witold Pedrycz, "Software Engineering, Engineering Approach", WileyIndia, 2007.

SOFT ELECTIVE-I
IN
II SEMESTER

ISS 454 : DECISION SUPPORT SYSTEMS

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

PRINCIPLES OF DMS: Principles of Decision Management Systems - Begin with the Decision in Mind - Be Transparent and Agile - Be Predictive, Not Reactive - Test, Learn, and Continuously Improve.

BUILDING DECISION MANAGEMENT SYSTEMS (6 hours) Building Decision Management Systems - Discover and Model Decisions - Characteristics of Suitable Decisions - A Decision Taxonomy - Finding Decisions - Documenting Decisions - Prioritizing Decisions.

UNIT-II **12 Hrs.**

DESIGN AND IMPLEMENT DECISION SERVICES : Design and Implement Decision Services - Build Decision Services - Integrate Decision Services - Best Practices for Decision Services Construction - Monitor and Improve Decisions - What Is Decision Analysis? - Monitor Decisions - Determine the Appropriate Response - Develop New Decision-Making Approaches - Confirm the Impact Is as Expected - Deploy the Change.

UNIT-III **12 Hrs.**

ENABLERS FOR DECISION MANAGEMENT SYSTEMS: Enablers for Decision Management Systems - People Enablers - The Three-Legged Stool - A Decision Management Center of Excellence - Organizational Change - Process Enablers - Managing a Decision Inventory - Adapting the Software Development Lifecycle - Decision Service Integration Patterns - Moving to Fact-Based Decisioning - The OODA Loop - Technology Enablers.

UNIT-IV **12 Hrs.**

BUSINESS RULES MANAGEMENT SYSTEMS: Business Rules Management Systems - Predictive Analytics Workbenches - Optimization Systems - Pre-Configured Decision Management Systems - Data Infrastructure - A ServiceOriented Platform.

REFERENCE BOOKS:

1. James Taylor, “Decision Management Systems-A Practical guide to using Business rules and Predictive Analytics”, IBM Press, 2012.
2. Efraim Turban , Jay E. Aronson , Ting-Peng Liang, “Decision Support Systems & Intelligent Systems”, 9th edition, Prentice Hall, 2010.
3. Alberto Cordoba, “Understanding the Predictive Analytics Lifecycle”, Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, “Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die”, Wiley, 2013.
5. George M Marakas, “Decision support Systems”, 2nd Edition, Pearson/Prentice Hall,2002
6. V.S. Janakiraman, K. Sarukesi, “Decision Support Systems”,PHI, ISBN8120314441, 9788120314443, 2004.
7. Efrem G Mallach, “Decision Support systems and Data warehouse Systems”, McGraw Hill, thirteenth reprint, 2008.

ISS 455 : INFORMATION MINING

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

INTRODUCTION :Introduction to Data Mining – Kind of Data – Functionalities – Interesting Patterns – Task Primitives – Issues-In Data Mining - Data Preprocessing: Why Preprocessing? – Data Summarization – Data Cleaning, Integration, Transformation, Reduction.

MINING FREQUENT PATTERNS :Mining Frequent Patterns: Associations And Correlations - Basic Concepts – Frequent Item Set Mining Methods – Mining Various Kinds Of Association Rules – Correlation Analysis – Constraint Based Association Mining..

UNIT-II **12 Hrs.**

Classification and Prediction: Issues Regarding Classification And Prediction – Decision Tree Induction Classification – Bayesian, Rule Based Classification – Support Vector Machine - Prediction: Linear, Non-Linear Regression – Accuracy and Error Measures.

UNIT-III **12 Hrs.**

CLUSTER ANALYSIS: Cluster Analysis: What Is Cluster Analysis? Types Of Data In Cluster Analysis – A Categorization Of Major Clustering Methods – Hierarchical Methods – Model Based Methods – Constraint Based Cluster Analysis.

UNIT-IV **12 Hrs.**

APPLICATIONS AND TRENDS IN DATA MINING: Applications and Trends in Data Mining: Data Mining Applications – Products And Research Prototypes –Additional Themes on Data Mining – Social Impacts of Data Mining – Trends in Data Mining..

REFERENCE BOOKS:

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

ISS 456 : PATTERN RECOGNITION

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.

Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation.

UNIT-II **12 Hrs.**

Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Basyessian belief network.

UNIT-III **12 Hrs.**

Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over-fitting & Pruning, Examples.

UNIT-IV **12 Hrs.**

Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, k-means, Isodata), clustering large data sets, examples.

REFERENCE BOOKS:

1. V Susheela Devi, M Narsimha Murthy,,Pattern Recognition (An Introduction) , Universities Press, ISBN 978-81-7371- 725-3,2011.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost.,Pattern Recognition & Image Analysis, PHI ISBN-81-203-1484-0, 1996.
3. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.

ISS 457 : OBJECT-ORIENTED ANALYSIS DESIGN WITH UML

Hours/Week: 4 I.A. Marks: 30
Credits : 4 Exam. Marks: 70

UNIT-I 12 Hrs.

Introduction, Modeling Concepts, class Modeling
What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT-II 12 Hrs.

Advanced Class Modeling, State Modeling : Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.
State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips. Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips. Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models

UNIT-III 12 Hrs.

Process Overview, System Conception, Domain Analysis
Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement.
Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.
Application Analysis, System Design: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations. Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

UNIT-IV 12 Hrs.

Class Design, Implementation Modeling, Legacy Systems: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing. Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance. Design Patterns, Idioms: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber. Management Patterns: Command processor; View handler. Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example.

REFERENCES BOOKS :

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005. Edition, Pearson Education, 2005. (Chapters 1 to 17, 23)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006. (Chapters 1, 3.5, 3.6, 4)
3. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson, 2007.
4. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.
5. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley-Dreamtech India, 2004.
6. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.

ISS 458 : SOFT-COMPUTING PARADIGM

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

GENETIC ALGORITHMS: Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction -Rank method - Rank space method. SOFTCOMPUTING AND CONVENTIONAL AI : AI search algorithm - Predicate calculus - Rules of interference - Semantic networks -Frames - Objects - Hybrid models - Applications.

UNIT-II **12 Hrs.**

FUZZY SYSTEMS: Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition -Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

UNIT-III **12 Hrs**
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NEURO - FUZZY MODELING : Adaptive networks based Fuzzy interface systems - Classification and Regression Trees -Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls -Simulated annealing - Evolutionary computation.

UNIT-IV **12 Hrs.**

GENETIC ALGORITHMS: Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction -Rank method - Rank space method. SOFTCOMPUTING AND CONVENTIONAL AI : AI search algorithm - Predicate calculus - Rules of interference - Semantic networks -Frames - Objects - Hybrid models - Applications.

REFERENCE BOOKS

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
3. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall, 1994.
4. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA 1995.
5. N. J. Nelsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Ltd., 1998.
6. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.

ISP 459 : DBMS Lab
ISP 460 : Information Mining Lab
ISP 461 : Pattern Recognition Lab

ISP 462 : Software Engineering Lb
ISP 463 : UML Modeling Lab
ISP 464 : Soft-Computing Paradigms Lab

OPEN ELECTIVE-I
IN
II SEMESTER

ISE 465 : WEB TECHNOLOGIES

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols - The World Wide Web-HTTP request message-response message-Web Clients Web Servers-Case Study. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative U RLs-Lists-tables-Frames-Forms-XML Creating HTML Documents Case Study. Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML Style Rle Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-Other Properties-Case Study. Client- Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators- Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

UNIT-II **12 Hrs.**

Host Objects : Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window-Case Study. Server-Side Programming: Java Servlets- Architecture -Overview-A Servelet-Generating Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies¬U RL Rewriting-Other Capabilities-Data Storage Servelets and Concurrency-Case Study- Related Technologies.

UNIT-III **12 Hrs.**

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration - Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data :XPATH-Template-based Transformations: XSLT-Displaying XML Documments in Browsers-Case Study- Related Technologies. Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Case Study-Related Technologies.

UNIT-IV **12 Hrs.**

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-DescribingWeb Services: WSDL- Representing Data Types: XML Schema-Communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets

REFERENCE BOOKS:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
3. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
4. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
5. Bates, "Developing Web Applications", Wiley, 2006.

ISE 466 : DATA MINING TECHNIQUES

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Introduction: Motivations, Data Mining Databases-Relational Data Bases, Data warehouse, Transactional Databases, Advanced Database systems and advanced Database applications. Data Mining Functionalities- Concept/Class Discrimination; characterizations and Discrimination, Association Analysis, Classification and Prediction, Cluster Analysis, Outlier Analysis and Evolution Analysis. Classifications of Data Mining Systems, Major issues in Data Mining.

Data Preprocessing: Introduction, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation Discretization.

UNIT-II **12 Hrs.**

Data Warehouse and OLAP Technology: An Overview, Introduction to Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

Data Cube Computation and Data Generalization: Data Cube Computation and Data Generalization: Efficient Method for Data Cube Computations, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT-III **12 Hrs.**

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Classification and Prediction: Introduction, Issues regarding classification and prediction, classification by decision tree Induction, Bayesian classification, Rule based Classification, Classification by back propagation and advanced classification methods, prediction, classification accuracy.

UNIT-IV **12 Hrs.**

Cluster Analysis: Introduction, Types of data in cluster analysis, A categorization of major cluster Methods, Partitioning methods, Hierarchical methods, Density-Base Methods, Grid-based methods, Model based Methods, Clustering High Dimensional Data, Outlier analysis. Introduction to Advanced Data Mining and their applications. Introductions to outlier Analysis Methods.

REFERENCE BOOKS:

1. Jaiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Morgan Kaufmann/Elsevier Science publisher, 3rd Edition. Indian Reprint 2009.
2. Arun K Pujari, Data Mining Techniques, University Press (INDIA) Pvt., 2003.
3. Krzysztof J Cios; Witold Pedrycz and Roman W Swiniarski and Lukasz A. Kurgan, Data Mining A Knowledge Discovery Approach, Springer International Edition: first Indian Reprint 2010.

III SEMESTER M.Sc. Information System								
Subject Code	Course	Theory Hours / Week	Practical Hours / Week	Duration of exams (Hrs)	Marks & Credits			
					IA	Exam	Total	Credits
HARD CORE								
ISH 501	Computer Graphics And Multimedia	4L	-	3	30	70	100	4
ISH 502	.Net Technologies	4L	-	3	30	70	100	4
ISH 503	Information Storage and Management	4L	-	3	30	70	100	4
SOFT CORE								
ISS 504 ISS 505 ISS 506 ISS 507 ISS 508	Information Retrieval System Data Science Methods Information Retrieval and Web Mining Distributed Computing Systems Android Application Programming	4L	-	3	30	70	100	4
ISP 509 ISP 510 ISP 511	Computer Graphics Lab Information Retrieval System Lab Data Science Methods Lab	---	6	3	30	70	100	3
ISP 512 ISP 513 ISP 514	.NET Programming Lab Distributed Computing Systems Lab Android Application Programming Lab	---	6	3	30	70	100	3
OPEN ELECTIVE								
ISE 515 ISE 516	Open Source Software Tools Mobile E-Commerce	3L		3	30	70	100	3*
	Total	19	12	21	210	490	700	22+3*

L:Lecture, P:Practical, T: Tutorials

ISH 501: COMPUTER GRAPHICS AND MULTIMEDIA

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

INTRODUCTION: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable pipelines; Performance characteristics. Graphics Programming: The Sierpinski gasket; Programming two-dimensional applications. **THE OPENGL:** The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting implicit functions.

UNIT-II **12 Hrs.**

INPUT AND INTERACTION: Interaction; Input devices; Clients and servers; Display lists; Display lists and modelling; Programming event-driven input; Menus; Building interactive models; Animating interactive programs; Design of interactive programs; Logic operations. **GEOMETRIC OBJECTS AND TRANSFORMATIONS:** Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modelling a colored cube; Affine transformations; Rotation, translation and scaling; Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices; Interfaces to three-dimensional applications;

UNIT-III **12 Hrs.**

VIEWING: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive mesh displays; Parallel-projection matrices; Perspective-projection matrices; Projections and shadows.

Basic implementation strategies; The major tasks; Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's algorithm; Polygon rasterization; Hidden-surface removal; Antialiasing; Display considerations.

UNIT-IV **12 Hrs.**

INTRODUCTION, MEDIA AND DATA STREAMS, AUDIO TECHNOLOGY: Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; Multimedia Databases; Multimedia Application Classes; Types of Multimedia Systems; Virtual Reality Design; Components of Multimedia Systems; Organizing Multimedia Databases;

REFERENCE BOOKS:

1. Edward Angel, **Interactive Computer Graphics A Top-Down Approach with OpenGL** 5th Edition, Addison-Wesley, 2008.
2. Ralf Steinmetz, Klara Narstedt,**,Multimedia Fundamentals: Vol 1-Media Coding and Content Processing** 2nd Edition, Pearson Education / PHI, 2003.
3. Prabhat K. Andleigh, Kiran Thakrar, ,**Multimedia Systems Design** PHI, 2003.
4. F.S. Hill,Jr. **,Computer Graphics Using OpenGL** 2nd Edition, Pearson Education, 2001.
5. Donald Hearn and Pauline Baker,**,Computer Graphics - OpenGL Version** 2nd Edition, Pearson Education, 2003.

ISH 502: .NET TECHNOLOGY

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

THE PHILOSOPHY OF .NET: Understanding the Previous State of Affairs, The .NET Solution, The Building Block of the .NET Platform (CLR,CTS, and CLS), The Role of the .NET Base Class Libraries, An Overview of .NET Binaries, The Role of the Common Intermediate Language, The Role of .NET Type Metadata, The Role of the Assembly Manifast, Compiling CIL to Platform –Specific Instructions, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Runtime A tour of the .NET Namespaces, Increasing Your Namespace Nomenclature, Deploying the .NET Runtime.

UNIT-II **12 Hrs.**

BUILDING C# APPLICATIONS: The Role of the Command Line Complier (csc.exe), Building C # Application using csc.exe Working with csc.exe Response Files, Generating Bug Reports , Remaining C# Compiler Options, The Command Line Debugger (cordbg.exe) Using the, Visual Studio .NET IDE, Other Key Aspects of the VS.NET IDE, C# "Preprocessor:" Directives.

C# LANGUAGE FUNDAMENTALS: The Anatomy of a Basic C# Class, Creating objects: Constructor Basics, The Composition of a C# Application, Default Assignment and Variable Scope, The C# Member Initialization Syntax, Basic Input and Output with the Console Class, Understanding Value Types and Reference Types, The Master Node: System, Object, The System Data Types (and C# Aliases), Converting Between Value Types and Reference Types: Boxing and Unboxing, Defining Program Constants, C# Iteration Constructs, C# Controls Flow Constructs, The Complete Set of C# Operators, Defining Custom Class Methods, Understating Static Methods, Methods Parameter Modifies, Array Manipulation in C #, String Manipulation in C#, C# Enumerations, Defining Structures in C#, Defining Custom Namespaces.

UNIT-III **12 Hrs.**

OBJECT- ORIENTED PROGRAMMING WITH C#: Forms Defining of the C# Class, Definition the "Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'s Encapsulation Services, Pseudo- Encapsulation: Creating Read-Only Fields, The Second Pillar: C#'s Inheritance Supports, keeping Family Secrets: The "Protected" Keyword, Nested Type Definitions, The Third Pillar: C #'s Polymorphic Support, Casting Between.

EXCEPTIONS AND OBJECT LIFETIME: Ode to Errors, Bugs, and Exceptions, The Role of .NET Exception Handling, Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception (System. System Exception), Custom Application-Level Exception (System. System Exception), Handling Multiple Exception, The Family Block, the Last Chance Exception Dynamically Identifying Application – and System Level Exception Debugging System Exception Using VS. NET, Understanding Object Lifetime, the CIT of "new', The Basics of Garbage Collection,, Finalization a Type, The Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, The System. GC Type

UNIT-IV **12 Hrs.**

INTERFACES AND COLLECTIONS: Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation, Interfaces As Polymorphic Agents, Building Interface Hierarchies,

Implementation Interfaces Using .NET, understanding the IConvertible Interface.

Callback Interfaces, Delegates, and Events, Advanced Techniques: Understanding Callback Interfaces, Understanding the .NET Delegate Type, Members of System. Multicast Delegate, Understanding Asynchronous Delegates, Understanding (and Using) Events. The Advances Keywords of C#, A Catalog of C# Keywords Building a Custom Indexer, Using C# Indexer from VB .NET. Overloading operators, The Internal Representation of Overloading Operators, interacting with Overload Operator from Overloaded- Operator- Challenged Languages, Creating Custom Conversion Routines, Defining Implicit Conversion Routines.

UNDERSTANDING .NET ASSEMBLES: An Overview of .NET Assembly, Building a Simple File Test Assembly, A C#. Client Application, A Visual Basic .NET Client Application, Cross Language Inheritance, Exploring the CarLibrary's, Manifest, Exploring the CarLibrary's Types, Building the Multifile Assembly, Using Assembly, Understanding Private Assemblies, Probing for Private Assemblies (The Basics), Private A Assemblies XML Configurations Files, Probing for Private Assemblies (The Details), Understanding Shared Assembly, Understanding Shared Names, Building a Shared Assembly, Understanding Delay Signing, Installing/Removing Shared Assembly.

REFERENCE BOOKS:

1. Andrew Troelsen, Special Edition,**,Pro C# with .NET 3.0** Dream tech Press, India, 2007.
2. E. Balagurusamy, 5th Reprint,**,Programming in C#** Tata McGraw Hill, 2004. (For Programming Examples)
3. Tom Archer,**,Inside C#** WP Publishers, 2001.
4. Herbert Schildt,**,C#: The Complete Reference** Tata McGraw Hill, 2004.

ISH 503: INFROMATION STORAGE AND MANAGMNET

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Introduction to Information Storage Management - Data Center Environment–Database Management System (DBMS) - Host - Connectivity –Storage-Disk Drive Components-Intelligent Storage System -Components of an Intelligent Storage System- Storage Provisioning- Types of Intelligent Storage Systems.

STORAGE NETWORKING : Fibre Channel: Overview - SAN and Its Evolution -Components of FC SAN -FC Connectivity-FC Architecture- IPSAN-FCOE-FCIP-Network-Attached Storage- General-Purpose Servers versus NAS Devices - Benefits of NAS- File Systems and Network File Sharing-Components of NAS - NAS I/O Operation -NAS Implementations -NAS File-Sharing Protocols-Object-Based Storage Devices-Content-Addressed Storage -CAS Use Cases.

UNIT-II 12 Hrs.

BACKUP AND RECOVERY: Business Continuity -Information Availability -BC Terminology-BC Planning Life Cycle - Failure Analysis -Business Impact Analysis-Backup and Archive - Backup Purpose -Backup Considerations -Backup Granularity - Recovery Considerations -Backup Methods -Backup Architecture - Backup and Restore Operations.

UNIT-III 12 Hrs.

CLOUD COMPUTING: Cloud Enabling Technologies -Characteristics of Cloud Computing - Benefits of Cloud Computing - Cloud Service Models-Cloud Deployment models-Cloud computing Infrastructure-Cloud Challenges. UNIT V-SECURING AND MANAGING STORAGE INFRASTRUCTURE (9 hours) Information Security Framework -Storage Security Domains-Security Implementations in Storage Networking - Monitoring the Storage Infrastructure -Storage Infrastructure Management Activities - Storage Infrastructure Management Challenges.

UNIT-IV 12 Hrs.

SECURING AND MANAGING STORAGE INFRASTRUCTURE (9 hours) Information Security Framework -Storage Security Domains-Security Implementations in Storage Networking - Monitoring the Storage Infrastructure -Storage Infrastructure Management Activities - Storage Infrastructure Management Challenges.

REFERENCE BOOKS:

1. WileyIndia, EMC Corporation, Information Storage and Management, 2nd Edition, 2011.
2. Robert Spalding, “Storage Networks: The Complete Reference”, Tata McGraw Hill, Osborne, 2003.
3. Marc Farley, Building Storage Networks, Tata McGraw Hill , Osborne,2nd Edition, 2001.
4. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002.

SOFT ELECTIVE-II
IN
III SEMESTER

ISS 504: INFROMATION RETRIEVAL SYSTEMS

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Boolean retrieval. The term vocabulary and postings lists. Dictionaries and tolerant retrieval. Index construction. Index compression.

UNIT-II 12 Hrs.

XML retrieval. Probabilistic information retrieval. Language models for information retrieval. Text classification. Vector space classification.

Support vector machines and machine learning on documents. Flat clustering. Hierarchical clustering. Matrix decompositions and latent semantic indexing.

UNIT-III 12 Hrs.

XML retrieval. Probabilistic information retrieval. Language models for information retrieval. Text classification. Vector space classification.

Support vector machines and machine learning on documents. Flat clustering. Hierarchical clustering. Matrix decompositions and latent semantic indexing.

UNIT-IV 12 Hrs.

Web search basics. Web crawling and indexes. Link analysis.

REFERENCE BOOKS:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütz, Introduction to Information Retrieval , Cambridge University Press, 2008.
2. Gerald J. Kowalski, Mark T. Maybury, Information Storage and Retrieval Systems: Theory and Implementation, Springer publication, 2008.
3. Ricardo Baeza-Yates,,Modern Information Retrieval, Pearson Education, 2009.
4. David A Grossman and Ophir Frieder, ,Information Retrieval: Algorithms and Heuristics, 2nd Edition, Springer, 2004.
5. William B Frakes, Ricardo BaezaYates,, Information Retrieval Data Structures and Algorithms, Pearson Education, 1992.

ISS 505: DATA SCIENCE METHODS

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Introduction: The Ascendance of Data, What Is Data Science?, Motivating Hypothetical:, Finding Key Connectors, Data Scientists You May Know, Salaries and Experience, Paid Accounts, Topics of Interest, Onward. **Python:** The Basics: Getting Python, The Zen of Python, Whitespace Formatting, Modules, Arithmetic, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries, Sets, Control Flow, Truthiness; The Not-So-Basics: Sorting, List Comprehensions, Generators and Iterators, Randomness, Regular Expressions, Object-Oriented Programming, Functional Tools, Enumerate, zip and Argument Unpacking, args and kwargs. **Visualizing Data:** matplotlib, Bar Charts, Line Charts, Scatterplots. **Linear Algebra:** Vectors, Matrices.

UNIT-II **12 Hrs.**

Statistics: Describing a Single Set of Data: Central Tendencies, Dispersion. Correlation, Simpson's Paradox, Some Other Correlation Caveats, Correlation and Causation. **Probability:** Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distributions, The Central Limit Theorem. **Hypothesis and Inference:** Statistical Hypothesis Testing, Example: Flipping a Coin, Confidence Intervals, P-hacking, Example: Running an A/B Test, Bayesian Inference. **Gradient Descent:** The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Putting It All Together, Stochastic Gradient descent. **Getting Data:** stdin and stdout, Reading Files: The Basics of text Files, Delimited Files. Scraping the Web: HTML and the Parsing Thereof, Example: O'Reilly Books About Data. Using APIs: JSON(and XML) Using an Unauthenticated API, Finding APIs Example: Using the Twitter APIs, Getting Credentials. **Working with Data:** Exploring Your Data: Exploring One-Dimensional Data, Two Dimensions, Many Dimensions; Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

UNIT-III **12 Hrs.**

Machine Learning: Modeling, What Is Machine Learning? Overfitting and Underfitting, Correctness, The Bias-Variance Trade-off, Feature Extraction and Selection. **k-Nearest Neighbors:** The Model, Example: Favorite Languages, The Curse of Dimensionality. **Naive Bayes:** A Really Dumb Spam Filter, A More Sophisticated Spam Filter, Implementation, Testing Our Model. **Simple Linear Regression:** The Model, Using Gradient Descent, Maximum Likelihood Estimation. **Multiple Regression:** The Model, Further Assumptions of the Least Squares Model, Fitting the Model, Goodness of Fit, Digression: The Bootstrap, Standard Errors f Regression Coefficients, Regularization. **Logistic Regression:** The Problem, The Logistic Function, Applying the Model, Goodness of Fit, Support Vector Machines. **Decision Trees:** What Is a Decision Tree? Entropy, The Entropy of a Partition, Creating a Decision Tree, Putting It All Together, Random Forests.

UNIT-IV **12 Hrs.**

Neural Networks: Perceptrons, Feed-Forward Neural Networks, Backpropagation, Example: Defeating a CAPTCHA. **Clustering:** The Idea, The Model, Example: Meetups, Choosing k, Example: Clustering Colors, Bottom-up Hierarchical Clustering. **Natural Language Processing:** Word Clouds, n-gram Models, Grammars, An Aside: Gibbs Sampling, Topic Modeling. **Network Analysis:** Betweenness Centrality, Eigenvector Centrality: Matrix Multiplication, Centrality; Directed Graphs and PageRank. **Recommender Systems:** Manual

Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering. **Database and SQL:** CREATE TABLE and INSERT, UPDATE,

DELETE, SELECT, GROUP BY,ORDER BY, JOIN, Subqueries, Indexes, Query Optimization, NoSQL, **MapReduce:** Example: Word Count, Why MapReduce? MapReduce More Generally, Example: Analyzing Status Upadates, Example: Matrix Multiplication, An Aside: Combiners.

REFERENCE BOOK:

1. Joel Grus, Data Science from Scratch: First Principles with Python, 1st Edition, ORIELLY Publications, 2015

ISS 506: INFORMATION RETRIEVAL AND WEB MINING

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Information Retrieval Basics Goals and history of IR. The impact of the web on IR. Components of an IR system, Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity. Simple tokenizing, stop-word removal, and stemming; inverted indices, Index Construction and compression. Information Retrieval Models Probabilistic Information Retrieval, Language Modeling for Information Retrieval, Adhoc Retrieval, Latent Semantic Indexing, Relevance feedback, Pseudo relevance feedback, Query expansion, Query languages, POS tagging,

UNIT-II 12 Hrs.

Web Mining Web Structure, content and usage mining, Web Crawling, Indexes, Search engines; spidering; metacrawlers; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank), Information Extraction, spam filtering, XML retrieval.
Performance metrics Recall, precision, and F-measure; Evaluations on benchmark text collections, TREC Tracks. Social Networks : Social Web, Blogs, Wikis, Forums, Social Network analysis, Recommender systems, Information Filtering, Collaborative filtering and content-based recommendation of documents and products.

UNIT-III 12 Hrs.

Semantic web Web 3.0, Ontology, OWL, RDF Schema, ontology learning, Knowledge representation, management and extraction, Multimedia Retrieval, Content based Image retrieval, Pattern Matching and classification for IR.

UNIT-IV 12 Hrs.

Specific topics in IR and Web Mining Focused Retrieval, Transfer Learning, Learning to Rank, Personalisation, Behavioral Targeting, Cross Language IR, Digital Libraries, Bibliographic systems, Patent Search, Elearning, Security Issues,Political and ethical issues.

REFERENCE BOOKS :

1. Yates & Neto, "Modern Information Retrieval", Pearson Education, ISBN 81-297-0274-6 (2011).
2. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze , “Introduction to Information Retrieval” (available online at http://nlp.stanford.edu/IR-book/)
3. Chakrabarti, S., Mining the Web, Morgan Kaufmann (An Imprint of Elsevier) 2005.
4. C.J.Rijsbergen, "Information Retrieval", http://www.dcs.gla.ac.uk/Keith/Preface.html)
5. Grossman, D. A. and Frieder, O., Information Retrieval: Algorithms and Heuristics. Kluwer 1998.
6. by Bruce Croft, Donald Metzler, and Trevor Strohman, Search Engines: Information Retrieval in Practice Addison-Wesley, 2009.
7. S. Buttcher, C. Clarke and G. Cormack,,Information Retrieval: Implementing and Evaluating Search Engines , MIT Press, 2010.

ISS 507: DISTRIBUTED COMPUTING SYSTEM

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I 12 Hrs.

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models-Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication. Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT II Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture, case study- SUN network file systems. Name Services-Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

UNIT-II 12 Hrs.

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, OceanStore, Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging. Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT-III 12 Hrs.

Transactions and Concurrency control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

UNIT-IV 12 Hrs.

Security-Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS, 802.11 Wi-Fi. Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, Other consistency models, CORBA case study-Introduction, CORBA RMI, CORBA Services.

REFERENCE BOOKS:

1. , G Coulouris, J Dollimore and T Kindberg, Distributed Systems Concepts and Design, Fourth Edition, Pearson Education.
2. S.Ghosh,,Distributed Systems, Chapman& Hall/CRC, Taylor & Francis Group, 2010.
1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
2. M Singhal, N G Shivarathri,,Advanced Concepts in Operating Systems, TMH.
3. K.P.Birman,,Reliable Distributed Systems, Springer.
4. A.S. Tanenbaum and M.V. Steen,Distributed Systems – Principles and Paradigms, , Pearson Education.
5. R.Chow, T.Johnson,,Distributed Operating Systems and Algorithm Analysis, Pearson.
6. A.S.Tanenbaum,,Distributed Operating Systems, Pearson education.
7. Ajay D.Kshemakalyani and Mukesh Singha,Distributed Computing, Principles, Algorithms and Systems, Cambridge Press, 2010.

ISS 508: ANDROID APPLICATON PROGRAMMING

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

UNIT-II **12 Hrs.**

Android User Interface: Measurements – Device and pixel density independent measuring unitsLayouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT-III **12 Hrs.**

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT-IV **12 Hrs.**

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update). Advanced Topics: Alarms – Creating and using alarms Using Internet Resources – Connecting to internet resource, using download manager Location Based Services – Finding Current Location and showing location on the Map, updating location.

REFERENCE BOOKS:

1. Reto Meier,,Professional Android 4 Application Development, Wiley India, (Wrox) , 2012.
2. James C Sheusi, Android Application Development for Java Programmers, Cengage Learning, 2013
3. Wei-Meng Lee,,Beginning Android 4 Application Development, Wiley India (Wrox), 2013

ISP 509:Computer Graphics Lab
ISP 510: Information Retrieval System Lab
ISP 511: Data Science Lab

ISP 512: .NET Programming Lab
ISP 513: Distributed Computing Systems Lab
ISP 514: Android Application Programming Lab

OPEN ELECTIVE-II IN III SEMESTER

ISE 515: OPEN SOURCE SOFTWARE TOOLS

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

Need of Open Sources –Advantages of Open sources – Over View of Applications- FOSS – FOSS usage –Free Software Movement – Comercial Aspect of Open Source Open Source Movement – Licensing – Certification – Open Source Software Software Development Model – comparision with close source / Proprietary software – Free Software – 04 Open source vs source –available –Widely used open source software license :Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public License and Mozilla Public License.

UNIT-II **12 Hrs.**

Installation of Linux (Redhat-CentOS): Theory about Open Source Multiboot Enviroment, Hardisk Partitioning, Swap space, LVM, and Bootloader Operating System 04 Command Line: Basic File System Manamgnet Task, Working with files, Piping and Redirection, Working with VI editor, use of sed and understanding FHS of Linux. Job management, Process Mangment, Mounting Open Source Devices and filesystem working with Linux, Backup, 04 working with user, group and permission, Managing Operating System: Software. Understanding Boot process and related system files, Common kernel Manamgnet Task.

UNIT-III **12 Hrs.**

Basic networking commands, Configuration of Apache Open source Web servers, DNS servers, DHCP servers, mail Servers, NFS, FTP servers. Operating System: 06 Securing servers with IPtables. Setting up Network and cryptographic services, SSL, Managing Certificate Security with OpenSSL, working with the GNU Privacy guard.

UNIT-IV **12 Hrs.**

Strutures, Script control, handling with signals, Creating functions, Operating System: working sed and gawk 08 Shell -Working with web using shell script: Downloading Programming web page as formatted text file and parsing for data, working cURL etc.

Android programming: Open Source Setting up Android Enviroment (using Eclipse for 10 Mobile android development), Activites and Intents, User Programming Interface, Designing UI using views, Data Persistence, Conent Providers, messaging and networking, Location-based Services, Publishing Android Applications.

REFERENCE BOOKS:

1. Sander van Vugt,Redhat Linux 6.0 Administration ,Wiley Publication, John Wiley & Son,2013
2. Sarath Lakshman,Linux Shell scripting Cookbook:, Packt publishing,2011
3. Dayanand Ambawade, Deven Shah, KLSI, ,Linux Lab and Open source Technology Dreamtech Press, 2014

ISE 516: MOBILE E-COMMERCE

Hours/Week: 4 **I.A. Marks: 30**
Credits : 4 **Exam. Marks: 70**

UNIT-I **12 Hrs.**

ELECTRONIC COMMERCE: Traditional commerce and E-commerce – Internet and WWW – Role of WWW – Value Chains – Strategic Business And Industry Value Chains – Role of E-commerce. Packet Switched Networks – TCP/IP Protocol Script – Internet Utility Programmes – SGML, HTML And XML – Web Client And Servers – Web Client/Server Architecture – Intranet And Extranets – Web Based Tools For E-commerce – Security. **MOBILE COMMERCE:** Introduction – Infrastructure of M–Commerce – Types Of Mobile Commerce Services – Technologies Of Wireless Business – Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non– Internet Applications In M–Commerce – Wireless/Wired Commerce Comparisons.

E-Commerce **UNIT-II** **12 Hrs.**

MOBILE COMMERCE: TECHNOLOGY: A Framework For The Study Of Mobile Commerce – NTT Docomo's I-Mode – Wireless Devices For Mobile Commerce – Towards A Classification Framework For Mobile Location Based Services – Wireless Personal And Local Area Networks –The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks.

UNIT-III **12 Hrs.**

MOBILE COMMERCE: THEORY AND APPLICATIONS: The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption of Mobile Gaming Services – Mobile Data Technologies And Small Business Adoption And Diffusion – E–commerce in The Automotive Industry – Location– Based Services: Criteria For Adoption And Solution Deployment – The Role of Mobile Advertising In Building A Brand – M–commerce Business Models.

UNIT-IV **12 Hrs.**

BUSINESS– TO– BUSINESS MOBILE E– COMMERCE: Enterprise Enablement – Email and Messaging – Field Force Automation (Insurance, Real Estate, Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking and Maintenance/Management – Remote IT Support – Customer Retention (B2C Services, Financial, Special Deals) – Warehouse Automation – Security.

REFERENCE BOOKS:

1. E.Brian Mennecke, J.Troy Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group Inc., IRM press, 2003.
2. Ravi Kalakota, B.Andrew Whinston, "Frontiers of Electronic Commerce", Pearson Education, 2003.
3. P. J. Louis, "M-Commerce Crash Course", McGraw- Hill Companies February 2001.
4. Paul May, "Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business" Cambridge University Press March 2001.

• IV SEMESTER M.Sc. Information System							
Subject Code	Subject	Practical Hours/ Week	Duration of exams (Hrs)	Marks & Credits			
				IA	Dissertation+ Viva Exam	Total	Credits
PCSH 551	Project Work Report Viva-Voce	32	-	120	280 (Report : 180 Viva-Voce: 100)	400	16
Grand Total Marks off I Semester						700	26
Grand Total Marks off II Semester						700	22+3*
Grand Total Marks off III Semester						700	22+3*
Total Marks of IV Semester						400	16
Grand Total Credits of all The Four Semesters						2500	86+6*

Project Work at Software Company / University/ National Institute

Hard core Credits: **16 + 12+12+16 = 52 (56.52%)**

Total Soft-Core Credits: **10 +10+10 = 30 (32.60%)**

Open Elective Credits: **03* +0 3* = 06* (6.55%)**

*** Not included for CGPA.**