JSS MAHAVIDYAPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY

Mysuru-570006.

Department of Information Science & Engineering

Bachelor of Engineering

In

Information Science & Engineering

SCHEME & SYLLABUS

III to VIII semesters

2017

Scheme of Teaching and Examination

BE in Information Science & Engineering

Third Semester BE

SL. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks			Exam Duration (Hours)
				L	T	P	Total		CIE	SEE	Total	
1.	MA310	Engineering Mathematics III	Mathematics	4	0	0	4.0	4	50	50	100	3
2.	IS310	Data Structures & Applications	IS&E	4	0	1	5.0	6	50	50	100	3
3.	IS320	Computer Organization & Architecture	IS&E	4	1	0	5.0	6	50	50	100	3
4.	IS330	Object Oriented Programming Concepts	IS&E	4	0	1	5.0	6	50	50	100	3
5.	IS340	Discrete Mathematical Structures	IS&E	4	1	0	5.0	6	50	50	100	3
6	HU320	Environmental Studies	Humanities	0	0	0	0.0	2	50	0	0	-
Total				20	2	2	24	30	300	250	500	-

Scheme of Teaching and Examination

BE in Information Science & Engineering

Fourth Semester BE

SL. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks			Exam Duration (Hours)
				L	T	P	Total		CIE	SEE	Total	
1.	MA410	Engineering Mathematics IV	Mathematics	4	0	0	4.0	4	50	50	100	3
2.	IS410	Design & Analysis of Algorithms	IS&E	4	0	1	5.0	6	50	50	100	3
3.	IS420	Operating Systems	IS&E	4	1	0	5.0	6	50	50	100	3
4.	IS430	UNIX Programming	IS&E	4	0	1	5.0	6	50	50	100	3
5.	IS440	Theory of Computation	IS&E	4	1	0	5.0	6	50	50	100	3
6	HU410	Constitution of India & Professional Ethics	Humanities	0	0	0	0.0	2	50	0	0	-
Total				20	2	2	24	30	300	250	500	-

Scheme of Teaching and Examination
BE in Information Science & Engineering
Fifth Semester BE

SL. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks			Exam Duration (Hours)
				L	T	P	Total		CIE	SEE	Total	
1.	IS510	Linear Algebra	IS&E	4	1	0	5.0	6	50	50	100	3
2.	IS520	Database Management System	IS&E	4	0	1	5.0	6	50	50	100	3
3.	IS530	Statistical Methods in Information Processing	IS&E	4	1	0	5.0	6	50	50	100	3
4.	IS540	Data Communication	IS&E	4	1	0	5.0	6	50	50	100	3
5.	IS55X	**Elective I**										
	IS551	Programming with Java	IS&E	4	0	1	5.0	6	50	50	100	3
	IS552	Web Programming	IS&E	4	0	1	5.0	6	50	50	100	3
	IS553	System Simulation Modeling	IS&E	4	0	1	5.0	6	50	50	100	3
Total				20	3	2	25	30	250	250	500	-

Scheme of Teaching and Examination

BE in Information Science & Engineering

Sixth Semester BE

SL. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks			Exam Duration (Hours)
				L	T	P	Total		CIE	SEE	Total	
1.	IS610	Software Engineering	IS&E	4	1	0	5.0	6	50	50	100	3
2.	IS620	Computer Networks	IS&E	4	0	1	5.0	6	50	50	100	3
3.	IS630	Data Mining	IS&E	4	0	1	5.0	6	50	50	100	3
4.	IS640	Management Information Systems	IS&E	4	1	0	5.0	6	50	50	100	3
5.	IS65X	**Elective-II**										
	IS651	Advanced Database Systems	IS&E	4	1	0	5.0	6	50	50	100	3
	IS652	Human Computer Interaction	IS&E	4	1	0	5.0	6	50	50	100	3
	IS653	Soft Computing	IS&E	4	1	0	5.0	6	50	50	100	3
	IS654	Computer Vision	IS&E	4	1	0	5.0	6	50	50	100	3
Total				20	3	2	25	30	250	250	500	-

Scheme of Teaching and Examination

BE in Information Science & Engineering

Seventh Semester BE

SL. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks			Exam Duration (Hours)
				L	T	P	Total		CIE	SEE	Total	
1.	IS710	Distributed Computing	IS&E	4	1	0	5.0	6	50	50	100	3
2.	IS720	Information & Network Security	IS&E	4	1	0	5.0	6	50	50	100	3
3.	IS730	Information Retrieval	IS&E	4	1	0	5.0	6	50	50	100	3
4.	IS74X	**Elective-III**										
	IS741	Cloud Computing	IS&E	4	1	0	5.0	6	50	50	100	3
	IS742	Cyber Security	IS&E	4	1	0	5.0	6	50	50	100	3
	IS743	Internet of Things	IS&E	4	1	0	5.0	6	50	50	100	3
	IS744	Robotics	IS&E	4	1	0	5.0	6	50	50	100	3
5.	IS75X	**Elective-IV**										
	IS751	Mobile Computing	IS&E	4	0	1	5.0	6	50	50	100	3
	IS752	C# Programming & .NET	IS&E	4	0	1	5.0	6	50	50	100	3
	IS753	Natural Language Processing	IS&E	4	0	1	5.0	6	50	50	100	3
	IS754	Internet Programming	IS&E	4	0	1	5.0	6	50	50	100	3
6.		Foreign Language	Humanities	0	0	0	0.0	2	-	-		
Total				18	4	1	25	30	250	250	500	-

Scheme of Teaching and Examination
BE in Information Science & Engineering
Eighth Semester BE

SL. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks			Exam Duration (Hours)
				L	T	P	Total		CIE	SEE	Total	
1.	IS81X	**Elective-V**										
	IS811	Storage Area Networks	IS&E	4	1	0	5.0	6	50	50	100	3
	IS812	Information Storage Management	IS&E	4	1	0	5.0	6	50	50	100	3
	IS813	Big Data Analytics	IS&E	4	1	0	5.0	6	50	50	100	3
2.	IS82X	**Elective-VI**										
	IS821	Financial Management	MBA	4	1	0	5.0	6	50	50	100	3
	IS822	Entrepreneurship Development	MBA	4	1	0	5.0	6	50	50	100	3
	IS823	Human Resource Management	MBA	4	1	0	5.0	6	50	50	100	3
	IS824	Software Project Management	MBA	4	1	0	5.0	6	50	50	100	3
3.	IS83P	Project Work	IS&E	0	0	17	17.0	30	100	100	200	3
Total				8	2	17	27	42	200	200	400	-

IS310 DATA STRUCTURES & APPLICATIONS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

After the completion of this course students should be able to
CO1: Explain the basic concepts of data structures.
CO2: Apply the concepts of linear and non-linear data structures to develop solutions for particular problem.
CO3: Develop algorithms for solving problems with the help of fundamental data structures

Introduction **10 Hours**

Review of Arrays, Structures, Self-Referential Structures, Pointers and Dynamic Memory Allocation, Functions, Array Operations: Traversing, inserting, deleting, searching, and sorting, Multidimensional Arrays, Strings: Basic Terminology, Storing, Operations and Pattern Matching algorithms, Programming Examples.

Stacks and Queues **10 Hours**

Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation , Infix to postfix conversion, evaluation of postfix expression, Recursion- Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function. Queues: Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues, Programming Examples.

Linked Lists **10 Hours**

Definition, Representation of linked lists in Memory, Memory allocation, Garbage Collection, Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists, Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation, Programming Examples.

Trees **10 Hours**

Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations, Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees- Evaluation of Expression, Programming Examples.

Advanced Trees and Hashing **10 Hours**

AVL trees: Concepts, Balancing the AVL tree after insertion and deletion: Multiway Trees – B-Trees – Search, Insertion, Deletion; B*-Trees, B+-Trees, Programming Examples. Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, Collision resolution by progressive overflow, Buckets, Other collision resolution techniques. Extendible Hashing: Introduction, Extendible Hashing Performance, Alternative approaches.

Text Books:

1. Fundamentals of Data Structures in C - Ellis Horowitz and Sartaj Sahni, 2nd edition, Universities Press, 2014

2. Data Structures - Seymour Lipschutz, Schaum's Outlines, Revised 1st edition, McGraw Hill, 2014

Reference Books:

1. An Introduction to Data Structures with Applications- Jean-Paul Tremblay & Paul G. Sorenson, 2nd Edition, McGraw Hill, 2013.

2. Data Structures using C - A M Tenenbaum, PHI, 1989.

3. Data Structures and Program Design in C – Robert Kruse, 2nd edition, PHI, 1996.

IS320 COMPUTER ORGANIZATION & ARCHITECTURE

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

After the completion of this course students should be able to
CO1: Explain the basic concepts of Computer organization
CO2: Illustrate the concepts of memory and I/O management.
CO3: Analyze processor performance improvement using instruction level parallelism

Introduction **10 Hours**

Basic structure of computers: Computer types, Functional units, Basic operational concepts, Bus structures, Performance, Historical perspective, Machine instructions & programs: Numbers, arithmetic operations & characters, Memory locations & addresses, Memory operations, Instructions & instruction sequencing; Addressing modes, Assembly language, Basic input/output operations, Stacks & queues, Subroutines, Additional instructions, Encoding of machine instructions.

Input/output Organization **10 Hours**

Accessing I/O devices, Interrupts, Direct memory access, Buses; Interface circuits, Standard I/O devices.

Memory system **10 Hours**

Basic concepts, Semiconductor RAM memories, Read-Only memories, Speed, size & cost, Cache memories, Performance considerations; Virtual memories, Secondary storage.

Arithmetic **10 Hours**

Addition & subtraction of signed numbers, Design of fast adders; Multiplication of positive numbers, Signed-operand multiplication, Fast multiplication, Integer division, Floating point numbers and operations.

Pipelining **10 Hours**

Basic concepts, Data Hazards, Instruction Hazards, Influence on Instruction sets, Data path & Control considerations, Superscalar Operation, UltraSPARC II example, Performance Considerations

Text Book:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5th edition, McGraw Hill International, 2002

Reference Books:

1. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Eighth Edition, Pearson.
2. B. Govindarajulu, “Computer Architecture and Organization: Design Principles and Applications”, Second Edition, Tata McGraw-Hill.

IS330 OBJECT ORIENTED PROGRAMMING WITH PYTHON

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes
On successful completion of the course, students should be able to:

CO1: Explain the features of object-oriented programming.
CO2: Apply File and Exception Handling concepts.
CO3: Analyse and apply Collections, Strings, and functions.

Object Oriented Programming **10 hrs**

OOP Concepts, Class Definitions, Class Instantiation, Class and Instance Variables, Class Functions and Instance Methods, Constructors and Destructors, Inheritance

Exception and File Handling **10 hrs**

Handling Exceptions, Raising Exceptions, Exception Propagation, User-Defined Exceptions, Reading From Text Files, Writing to Text Files, Reading from Binary Files, Writing to Binary Files, Seeking Within Files

Introduction to Python **10 hrs**

Python, Python **Basics** (Data Types, Operations on Data Types, Data Type Conversions, Basic I/O, Basic Formatting) Python, **Control Structures** (Decisions, Loops)

Collections **10 hrs**

Lists, Tuples, Sets, Dictionaries

Strings, Functions and Practical Python **10 hrs**

Strings (Searching, Splitting, Joining)
Functions (Definition, Call, Positional Arguments, Default Arguments, Keyword Arguments, Variable Arguments, Returning From Functions, Lambda Expressions, Unpacking Argument Lists)
Practical Python (Stacks, Queues, Sequence Processing using map, filter and reduce, List Comprehensions, Matrices)

Text Book:

1. “Learning Python”, B. Nagesh Rao, A Cyber plus Publication, First Edition, 2017

Reference Book:

1. “Learning Python”, by Mark Lutz, Fifth Edition, O’Reilly Media Publications, 2013.

IS340 DISCRETE MATHEMATICAL STRUCTURES

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes
On successful completion of the course, students should be able to:

CO1: Define and illustrate the basic concepts of discrete mathematical structures.
CO2: Apply logic, set theory, relations and functions.
CO3: Analyze and examine the concepts of Graph and Coding Theory.

Mathematical Logic **10 Hours**

Proposition – Connectives – Truth Tables - Conditional and bi conditional propositions – Tautology and contradiction - Duality Law – Algebra and laws of Algebra of propositions – Tautological Implication Theory of Inference – Rules of Inference – Inconsistency – Indirect method of Proof.

Counting, Relations and Digraphs **10 Hours**

Counting – Permutations, Combinations, The pigeonhole Principle, Elements of Probability, Recurrence Relations. Relations and Digraphs – Product Sets and Partitions, Relations and Digraphs- Paths in Relations and Digraphs- Properties of Relations- Equivalence relations – Manipulations of Relations – Transitive Closure and Warshall's Algorithm.

Functions and Order Relations and Structures **10 Hours**

Functions – Functions for Computer Science, Permutations Functions, Growth of Functions. Order Relations - Partially ordered sets, External Elements of Partially Ordered Sets, Lattices, Functions on Boolean Algebras, Boolean Functions as Boolean Polynomials.

Graph Theory and Applications **10 Hours**

Graphs – Euler paths and circuits – Hamilton Paths and Circuits – Colouring Graphs. Trees – Definitions- Trees- Labelled Trees – Tree Searching – Undirected Trees – Minimum Spanning Trees.

Group Theory and Coding Theory **10 Hours**

Binary Operations Revisited- Semi groups- Products and Quotients of Semi groups - Groups- Products and Quotients of Groups – Coding of Binary Information and Error Detection – Decoding and Error Correction.

Text Books:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2004.

2. Bernard Kolman. Robert C. Busby. Sharon Ross: Discrete Mathematical Structures. 5Th Edition.

Reference Books:

1. Discrete Mathematics and Its Applications, Kenneth Rosen, Mc Graw Hill, 6th edition

IS410 DESIGN & ANALYSIS OF ALGORITHMS

Total Teaching Hours: 50 **No. of Credits: 05**

Course Outcomes

On completion of this course, the students should be able to:

CO1: Explain the complexity of divide and conquer, greedy, dynamic programming and backtracking algorithms.
CO2: Identify and analyze appropriate algorithmic design technique for new problems.
CO3: Apply important algorithmic design paradigms and methods of analysis

Introduction **10 Hrs**

What is an Algorithm? Algorithm Specification, Analysis Framework, Performance Analysis: Space complexity, Time complexity, Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems, Fundamental Data Structures: Stacks, Queues, Graphs, Trees, Sets and Dictionaries.

Divide and Conquer **8 Hrs**

General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum, Merge sort, Quick sort, Strassen's matrix multiplication, Advantages and Disadvantages of divide and conquer, Decrease and Conquer Approach, Topological Sort

Greedy Method **10 Hrs**

General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines, Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm, Single source shortest paths: Dijkstra's Algorithm, Optimal Tree problem: Huffman Trees and Codes, Transform and Conquer Approach: Heaps and Heap Sort

Dynamic Programming **10 Hrs**

General method with Examples, Multistage Graphs, Transitive Closure: Warshall's Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem Bellman-Ford Algorithm, Travelling Sales Person problem, Reliability design

Backtracking **12Hrs**

General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles, and Lower bound theory: Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems.

Text Books:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009, Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press.

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

IS420 OPERATING SYSTEMS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

Students should be able to:
CO1: Explain the fundamental concepts in operating systems.
CO2: Apply the concepts to solve problems related to process, memory and files.
CO3: Demonstrate competence in recognizing and using operating system features.

Introduction **07 Hours**

Concepts, OS objectives, OS functions, OS views, OS design issues, OS supports & services, Evolution of system structure.

Process management **16 Hours**

Concept, process models, threads: thread states, types of threads, thread priority, multithreading, scheduling: short-term scheduler types of schedulers, non-preemptive & preemptive strategies, interprocess synchronization: concepts, critical section problem, peterson's solution, synchronization hardware, semaphores, bounded buffer problem, readers-writers problem, dining philosophers problem, deadlocks: deadlocks & starvation, conditions for deadlocks, deadlock detection, deadlock prevention, deadlock recovery, deadlock avoidance, starvation.

Memory management **09 Hours**

Key Characteristics, memory management functions, logical address & physical address, address translation, management schemes: contiguous memory allocation & non-contiguous memory allocation, virtual memory: paging, segmentation, cache memory design issues.

Device & file management **09 Hours**

Device Characteristics, types, device controller, operations, buffering & types of buffering, clock, disk, management, disk arm scheduling policies, RAID, File system, server, management, design, organization, directory, sharing, blocking, management, allocation, file system reliability

Security & Protection **09 Hours**

Overview, goals, security threats, attacks, design issues, protection structure, intruders, authentication, malicious programs, encryption: symmetric encryption, public key encryption.

Text Books:

1. Operating System Principles, Abraham Silberschatz, Peter Galvin, Greg Gagne, India. Wiley-
2. Operating Systems, A concept–based evolutionary approach, P Chakraborty, Jaico publishing house.

Reference Books:

1. Modern Operating Systems, Andrew S Tanenbaum , Herbert Bos, 4th Edition, Pearson Edition.

IS430 UNIX PROGRAMMING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Define the concepts of Unix systems and Programming
CO2: Implement programs using files and process API's
CO3: Illustrate the use of File, process and IPC

Background and commands **10 hours**

Architecture and Salient features of a UNIX System, The Parent-Child Relationship, Pattern Matching – The Wild-cards, Escaping and Quoting, Simple filters

Shell Script **09 hours**

Shell Scripts: read, Command Line Arguments, exit status, the Logical Operators, the if Conditional, using test and [ ] to evaluate expressions, the case, expr: while: Looping, for: Looping set and shift, trap: Interrupting. Development of simple shell scripts.

Unix File Systems **10 hours**

UNIX file systems: file types, file systems, file attributes, Inodes in UNIX system. UNIX file APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs

Process Control **12 hours**

UNIX Process: UNIX Kernel Support for Processes, setjmp and longjmp Functions, getrlimit, setrlimit Functions UNIX Process Control: Introduction, Process Identifiers, fork, vfork, exit, exec Functions, Changing User IDs and Group IDs, system Function, Process Accounting, User Identification.

Daemon Processes and IPCs **09 hours**

Daemon Processes: Daemon Characteristics, Coding Rules, Error Logging, Inter process Communication API's: Pipes, FIFOs, Message Queues, Semaphores

Text Books:

1. Sumitabha Das, *UNIX Concepts and Applications*, 4th edition, Tata McGraw Hill, 2006
2. Richard Stevens: *Advanced Programming in the UNIX Environment,* Addison-Wesley, 1993.

Reference Books:

1. Behrouz A. Forouzan and Richard F.Gilberg ,*Unix and Shell Programming* A Text book, Thomson, Edition-2003.
2. Kenneth Rosen, Douglas Host, James Farber and Richard Rosinski, The Complete Reference UNIX, Tata McGraw- Hill, Edition 2000.
3. Terrence Chan, Unix *System Programming Using C++,* Prentice Hall India, 1999
   A Paul K Andersen**,** *Just Enough UNIX***,** 5th edition, McGraw Hill, 2006.

IS440 THEORY OF COMPUTATION

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

After completing this course, the students would be able to:
CO1: Explain the computational problems in terms of appropriate automaton.
CO2: Apply automation model to represent and solve computational problems.
CO3: Analyse list of problems to devise a system using specific models.

Finite Automata **10 Hours**

Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions– Finite Automaton – DFA & NDFA – Finite Automaton with €-moves – Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NDFA's with and without €-moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA- - Pumping Lemma for Regular sets – Problems based on Pumping Lemma.

Grammars **10 Hours**

Grammar Introduction– Types of Grammar - Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions - Null productions – Greiback Normal form – Chomsky normal form – Problems related to CNF and GNF.

Pushdown Automata **10 Hours**

Pushdown Automata- Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL - pumping lemma for CFL – problems based on pumping Lemma

Turing Machine **10 Hours**

Turing Machines- Introduction – Formal definition of Turing machines – Instantaneous descriptions- Turing Machine as Acceptors – Turing Machine as Transducers Computable Languages and functions – Turing Machine constructions – Modifications of Turing Machines

Computational Complexity **10 Hours**

Undecidability- Basic definitions- Decidable and undecidable problems - Properties of Recursive and Recursively enumerable languages – Introduction to Computational Complexity: Definitions-Time and Space complexity of TMs – complexity classes – introduction to NP-Hardness and NP-Completeness.

Text Book:

1. Hopcroft J.E., Motwani R. and Ullman J.D, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2008.

References Books:

1. John.C.Martin, “Introduction to Languages and the Theory of Computation”, McGraw-Hill Education, 01-May-2010.
2. Michael Sipser, “Introduction to the Theory of Computation” Cengage Learning, 2012.
3. Peter Linz , “An introduction to formal languages and automata”, Jones & Bartlett Learning, 2001.

IS510 LINEAR ALGEBRA

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

On successful completion of the course, students should be able to:
CO1: Define and interpret linear equations and write equations in matrix form.
CO2: Identify the basis for a given matrix, vector space and subspace.
CO3: Solve problems related to orthogonality and apply Eigen vectors to solve differential equations.

Introduction to vectors **10 hours**

Vectors and linear combinations, lengths and dot products, vectors and linear equations. Idea of elimination.

Solving linear equations **10 hours**

Elimination using matrices, rules for matrix operations, inverse matrices, LU factorization, transposes and permutations.

Vector spaces and subspaces **10 hours**

Vector space, solving for Ax = 0, Rank and row reduced form, solution to Ax = B, independence basis and dimension, dimensions of the 4 subspaces.

Orthogonality and Determinants **10 hours**

Orthogonality of the 4 subspaces, projections, least square approximations, orthogonal basis and gram- Schmidt, the properties of determinants, permutations of co-factors, Cramer's rule, inverse, and volumes.

Eigenvalues and Eigenvectors **10 hours**

Introduction to Eigenvalues, Diagonalizing a matrix, applications to differential equations, symmetric matrices, positive define matrices, similar matrices, singular value decompositions, least square methods.

Text Book:

1. Introduction to Linear Algebra, Gilbert Strang, 2009, Wellesley Cambridge press, 4th edition

Reference Book:

1. Linear Algebra and its Application **-** David C Lay, Addison Wesley, 4th edition.

IS520 DATABASE MANAGEMENT SYSTEMS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain the concepts of relational database design.
CO2: Design and Implement queries using Structured Query Language (SQL).
CO3: Explore the concepts of Transactions in Database Systems.

Introduction **10 hours**

Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; Data models, schemas and instances; Three-schema architecture and data independence; Centralized and client-server architectures. Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.

Relational Model: Concepts, Constraints and Database Design **10 hours**

Relational Model Concepts, Constraints and database schemas, Update operations, transactions, and dealing with constraint violations. Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form Properties of Relational Decompositions;

Algorithms for Relational Database Schema Design **10 hours**

Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form; Inclusion Dependencies; Other Dependencies and Normal Forms. The role of information systems in organizations, the database design and implementation processing, automated design tools.

SQL **10 hours**

SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries.
Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL; Additional features of SQL;
Database programming issues and techniques; Embedded SQL, Dynamic SQL; Database stored procedures and SQL / PSM.

Transaction Management **10 hours**

The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of locking; Transaction support in SQL; Introduction to crash recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Checkpoint; Recovering from a System Crash; Media Recovery; Other approaches and interaction with concurrency control.

Text Books:

1. Elmasri and Navathe: *Fundamentals of Database Systems*, 5th Edition, Pearson Education, 2007.
2. Raghu Ramakrishnan and Johannes Gehrke: *Database Management Systems*, 3rd Edition, McGraw-Hill, 2003.

Reference Books:

1. Silberschatz, Korth and Sudharshan: *Data base System Concepts*, 6th Edition, Mc-GrawHill, 2010.
2. C.J. Date, A. Kannan, S. Swamynatham: *An Introduction to Database Systems*, 8th Edition, Pearson Education, 2006.

IS530 STASTISTICAL METHODS IN INFORMATION PROCESSING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

After the completion of this course students should be able to

CO1: Explain the different statistical measures and analysis types available.
CO2: Apply a selected method to solve an unknown problem.
CO3: Analyze results and make inferences.

Introduction to Statistics **10 Hrs**

Introduction to uni-variate data, Measures of central tendency, Arithmetic mean, Median, Mode, Geometric Mean and Harmonic Mean, Measures of dispersion, Range, Quartile deviation, Mean deviation, Standard deviation and Co-efficient of variation, Skewness, Kurtosis and Moments, Problems.

Correlation and regression analysis **10 Hrs**

Introduction to Correlation analysis, Types of correlation, Methods of studying correlation – Karl. Pearson's coefficient of correlation Rank correlation method, Partial and Multiple Correlation, Introduction to Regression analysis – Regression lines, Properties of Regression coefficients, Angle between two regression lines, Problems.

Analysis of Time Series **10 Hrs**

Components of time series – Problems of classifications – Methods of measuring trends, Freehand graphing method, semi average method, moving average method, method of least squares, Introduction to Measurement of seasonal variation, Method of simple averages (weekly, monthly and quarterly), Ratio to trend method, Problems.

Analysis of variance **10 Hrs**

Introduction to Small sample tests based on t and F distribution, Test for single mean, difference between means, Paired t-test, Test for equality of variances, ANOVA- one -way classification, Two-way classification., Non-Parametric Test: The Mann Whitney test, The Kruskal-Wallis single-factor analysis of variance by ranks, Procedure, Problems.

Statistical Quality Control **10 Hrs**

Introduction - Process control, control charts for variables - Mean and Range chart (X Bar and R), control charts for variables - Mean and Standard deviation chart (X Bar and s), Introduction to Attributes Control charts, Control chart for the number of defectives (np-chart), Control chart for the fraction of defectives (p-chart), Control chart for the number of defects (c-chart).

Text Book:

Statistics for Technology- A course in Applied Statistics, C.Chatfield

Reference Books:

1. Fundamentals of Mathematical Statistics, S.C.Gupta and V.K.Kapoor
2. Elements of business Statistics, S.P.Gupta
3. Fundamentals of Applied Statistics, S.C.Gupta and V.K.Kapoor
4. Statistics – Theory and Practice, R.S.N.Pillai, & V.Bagavathi
5. Mathematical statistics with Application, John E. Freund's
6. Statistic – Problems and Solutions, V.K.Kapoor

IS540 DATA COMMUNICATION

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Describe the basic concepts of data communication and transmission techniques.
CO2: Identify the different types of errors, data link protocols and spread spectrum techniques
CO3: Illustrate the topologies, protocols for wireless communication

Introduction to Data Communications **10 Hours**

Data communications, data networking, and the internet – data communications and networking for today's Enterprise, A communication model, Data communications, networks, The internet, An example configuration.
Protocol Architecture, TCP/IP and internet-based applications- the need for protocol architecture, The TCP/IP protocol architecture, The OSI model, standardization with a protocol architecture, traditional internet based applications, multimedia.

Data Transmissions – Concepts & Techniques **10 Hours**

Data Transmission- concepts and terminology, analog and digital transmission, transmission impairments, channel capacity. Transmission Media- guided transmission media, wireless transmission, wireless propagation, line of sight transmission. Signal Encoding- digital data, digital signals, digital data, analog signals, analog data, digital signals, analog data, analog signals.

Digital Communication Techniques **10 Hours**

Asynchronous and synchronous transmission, types of errors, error detection, error correction, line configuration. Data link control protocols- Flow control, Error control, High level data link control (HDLC). Multiplexing- frequency division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, asymmetric digital subscriber line, xDSL. Spread spectrum- the concept of spread spectrum, frequency hopping spread spectrum, direct sequence spread spectrum, code division multiple access.

Switching in Communication Networks **10 Hours**

Circuit Switching and Packet Switching- Switched communication network, circuit switching networks, circuit switching concepts, soft switch architecture, packet switching principles, X.25, Frame relay. Cellular wireless networks- principles of cellular networks, first generation analog, second generation CDMA, third generation system.

Local Area Networks **10 Hours**

Background, topologies and transmission media, LAN protocol architecture, bridges, layer 2 and layer 3 switches. High speed LANs- the emergence of high speed LAN, Ethernet, fire channel. Wireless LANs- overview, wireless LAN technology, IEEE 802.11 architecture and services, IEEE 802.11 medium access control, IEEE 802.11 physical layer, IEEE 802.11 security considerations.

Text Books:

1. *Data and Computer Communications*, William Stallings, 10th Edition, Prentice Hall Edition.
2. *Data Communications and Networking*, Behrouz Forouzan, 4th edition, McGraw Hill Edition

Reference Books:

1. *Communication Networks. Fundamentals Concepts and Key Architecture*, Alberto Leon-Garcia and Indra Widjaja, 2003 Edition, McGraw-Hill.
2. *Computer Networks, Andrew Tanenbaum, 4th edition, Prentice Hall*
3. *TCP/IP Protocol Suite, Behrouz* Forouzan, 3RD Edition, McGraw Hill

IS551 PROGRAMMING WITH JAVA

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

On successful completion of the course, students should be able to:
CO1: Illustrate core concepts of object-oriented programming using Java programming.
CO2: Demonstrate object-oriented design features such as encapsulation, polymorphism and Inheritance.
CO3: Apply common object-oriented design patterns and develop applications with event-driven graphical user interface.

Introduction to JAVA **10 hrs**

Java and Java applications; Java Development Kit (JDK); Java is interpreted, Byte Code, JVM; Object-oriented programming; Simple Java programs. Data types and other tokens: Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers. Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The ? Operator; Operator Precedence; Logical expression; Type casting; Strings. Control Statements: Selection statements, iteration statements, Jump Statements. 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 **10 hrs**

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. 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.

Swings **10hrs**

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. 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.

Servlets **10hrs**

Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking.**JSP, RMI:**Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects.

Java Remote Method Invocation: **10hrs**

Remote Method Invocation concept; Server side, Client side. **EJB**; Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean; The JAR File.

Text Books:

1. **Java The Complete Reference -**Herbert Schildt, 7th Edition, Tata McGraw Hill, 2007.
2. **J2EE The Complete Reference -**Jim Keogh, Tata McGraw Hill, 2007.

Reference Books:

1. **Introduction to JAVA Programming -**Y. Daniel Liang, 6th Edition, Pearson Education, 2007.
2. **The J2EE Tutorial -**Stephanie Bodoff , 2nd Edition, Pearson Education, 2004.

IS552 WEB PROGRAMMING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain the various web programming concepts
CO2: Develop dynamic web pages using scripting languages
CO3: Design and develop client and server applications

FUNDAMENTALS OF WEB **10 Hours**

XHTML – 1: Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; Security; The Web Programmers Toolbox. XHTML: Origins and evolution of HTML and XHTML; Basic syntax; Standard XHTML document structure; Basic text markup. XHTML – 2: Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML and XHTML.

CASCADED STYLE SHEET and JAVASCRIPT **10 Hours**

Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images; The and tags; Conflict resolution.JAVASCRIPT:Overview of Javascript; Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; Pattern matching using regular expressions; Errors in scripts; Examples.

JAVASCRIPT AND HTML DOCUMENTS: **10 Hours**

The Javascript execution environment; The Document Object Model; Element access in Javascript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The DOM 2 event model; The navigator object; DOM tree traversal and modification. Introduction to dynamic documents; Positioning elements; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor; Reacting to a mouse click; Slow movement of elements; Dragging and dropping elements.

PERL, CGI PROGRAMMING **10 Hours**

Origins and uses of Perl; Scalars and their operations; Assignment statements and simple input and output; Control statements; Fundamentals of arrays; Hashes; References; Functions; Pattern matching; File input and output; Examples. CGI linkage; Query string format; CGI.pm module; a survey example; Cookies;

XML AND PHP **10 Hours**

Introduction; Syntax; Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets; XML processors; Web services. PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Cookies, Session tracking, Database access with PHP and MySQL.

Text Book:

1. *Programming the World Wide Web* – Robert W. Sebesta, 4th Edition, Pearson Education, 2008.

Reference Books:

1. *Internet & World Wide Web How to H program* – M. Deitel, P.J. Deitel, A. B. Goldberg, 3rd Edition, Pearson Education / PHI, 2004.
2. *Web Programming Building Internet Applications* – Chris Bates, 3rd Edition, Wiley India, 2006.
3. *The Web Warrior Guide to Web Programming* – Xue Bai et al, Thomson, 2003.

IS553 SYSTEM SIMULATION AND MODELING

Total Teaching hours: 50 **No of credits: 05**

Course Outcomes

After competition of the course students should be able to:
CO1: Explain the framework for discrete event simulation
CO2: Design input-output models for discrete event simulation
CO3: Demonstrate the simulation models for problem-solving

Introduction to system simulation **10Hrs**

Introduction to system modeling and simulation: an overview of computer simulation, discrete event simulation, continuous simulation, Monte Carlo simulations, how to perform discrete event simulation, a framework for modeling the simulation, Examples with an illustration of DES, application of the framework for real-time applications.

Input-output modeling **10Hrs**

Input modeling for DES: empirical input modeling, an overview of theoretical distribution,theoretical modeling of arrival process, theoretical modeling of process time, modeling the service time, modeling and analyzing single server system, execution rules, and specification of graph-based models, event graph modeling template, real-time examples of DES using graph-based models. Parameterize

Graph-based modeling **10Hrs**

Event Graph Modeling and Simulation: Parameterized Event Graph Examples, Execution Rules and Specifications of the Parameterized Event Graph, Parameterized Event Graph Modeling of Tandem Lines, Parameterized Event Graph Modeling of Job Shops, Execution of Parameterized Event Graph Models Using SIGMA.

Activity-based modeling **10Hrs**

Introduction to activity based modeling and simulation: def. and specification of activity cycle graph, activity cycle modeling template, activity-based modeling example, parameterized activity cycle diagram and its applications, execution of activity cycle diagram.

The framework of system simulation **10Hrs**

Simulation of ACD using Arena: arena basics, ACD to arena conversion, ACD arena modeling examples. Output analysis and optimization: a framework for output analysis, qualitative output analysis, statistical output analysis, linear regression modeling for output analysis, response surface methodology for simulation. State-based modeling for simulation: finite state machine, timed

automata, state graph, system modeling with state graph, simulation of composite state graph models

Text Book:

1. Byoung Kyu Choi and DongHun Kang, Modeling and Simulation of Discrete Event Systems, Wiley,2013.

Reference Books:

1. Banks, J. and Carson, J. S., “Discrete Event System Simulation”,2009, Prentice Hall.
2. Averill, M. L., and Kelton, W.D., “Simulation Modeling and Analysis”, 2006, McGraw Hill.

IS610 SOFTWARE ENGINEERING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes (CO): At the end of the course student will be able to:

CO1: Explain software engineering process and translate a requirements specification into high level and low level architecture

CO2: Develop application using software development techniques and understand software evolution.

CO3: Employ verification and validation techniques and estimate software cost

Overview **10 hours**

Introduction: FAQ's about software engineering, Professional and ethical responsibility. Critical Systems, Software Processes: Critical Systems: A simple safety-critical system; System dependability; Availability and reliability. Software Processes: Models, Process iteration. Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document; Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management

Software Design **10 hours**

Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles. Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution

Development **10 hours**

Rapid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution

Verification and Validation **10 hours**

Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods. Software testing: System testing; Component testing; Test case design; Test automation.

Management **10 hours**

Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model. Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing.

Text Book:

1. Software Engineering, Ian Sommerville, 8th edition, Person Education Ltd., 2007.

Reference Books:

1. *Software Engineering-A Practitioners approach*, Roger.S.Pressman, 7th edition, McGraw-Hill, 2007.
2. *Software Engineering Theory and Practice*, Shari Lawrence Pfleeger, Joanne M. Atlee, 3rd edition, Pearson Education, 2006.
3. *Software Engineering Principles and Practice*, Waman S Jawadekar, Tata McGraw Hill, 2004.

IS620 COMPUTER NETWORKS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain the concepts of Computer Networks
CO2: Identify the services provided by different layers and protocols associated with them.
CO3: Illustrate the working principles of protocols and its applications

Introduction to Computer Networks **10 hours**

The Network Edge. The Network Core. Network Access and Physical Media, ISPs and Internet Backbones. Delay and Loss in Packet-Switched Networks. Protocol Layers and Their Service Models.

Application Layer Protocols **10 hours**

Principles of Application Layer Protocols. The Web and HTTP. File Transfer: FTP. Electronic Mail in the Internet. DNS-The Internet's Directory Service. Socket Programming with TCP. Socket Programming with UDP.

Transport Layer Protocols **10 hours**

Introduction and Transport-Layer Services. Multiplexing and Demultiplexing. Connectionless Transport: UDP. Principles of Reliable Data Transfer. Connection-Oriented Transport: TCP. Principles of Congestion Control.

Networking Layer & Routing Protocols **10 hours**

Introduction and Network Service Model. Routing Principles. Hierarchical Routing. The Internet Protocol. Routing and the Internet. Ipv6.

Multimedia Networking Protocols **10 hours**

Multimedia Networking Applications, Streaming Stored Audio and Video, Making the Best of the Best-Effort Service: An Internet Phone Example, RTP, Beyond Best-Effort, Scheduling and Policing Mechanisms**.**

Text Book:

1. *Computer Networking: A Top-Down Approach Featuring the Internet*, 7/E **James F. Kurose, Pearson Education**

Reference Books:

1. ***Computer networks*, 4/e Andrew s Tannenbaum, Prentice Hall**
2. ***Computer Networks A Systems Approach*, 4/e, Peterson Davis, Morgan Kaufmann series in networking**

IS630 DATA MINING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

On successful completion of the course, students should be able to:
CO1: Explain the basic concepts, principles and techniques of data mining
CO2: Apply the concepts of Supervised and Unsupervised learning techniques
CO3: Illustrate the recent trends and applications of data mining techniques.

Syllabus

Introduction to Data Mining **10 Hours**

Overview on Data Mining, Motivating Challenges; The origins of data mining; Data Mining Tasks. Types of Data, Data Quality, Data Pre-processing; Measures of Similarity and Dissimilarity Data visualization techniques.

Classification **10 Hours**

Preliminaries; General approach to solving a classification problem; Naïve Bayes Classifier, Decision tree induction; Rule-based classifier, Nearest-neighbour classifier, Bayesian classifier.

Cluster Analysis **10 Hours**

Overview, Partition clustering, K-means, Agglomerative hierarchical clustering, DBSCAN, Overview of Cluster Evaluation.

Association Rule Mining **10 Hours**

Problem Definition; Frequent Itemset generation; Rule Generation; Compact representation of frequent itemset, Alternative methods for generating frequent itemset. FP-Growth algorithm, Evaluation of association patterns; Effect of skewed support distribution; Sequential patterns.

Recent Trends & Applications of Data Mining **10 Hours**

Multidimensional analysis and descriptive mining of complex data objects; spatial data mining; Multimedia data mining; Text mining; Mining the WWW. Outlier analysis. Data mining applications; Data mining system products and research prototypes; Additional themes on Data mining; Social impact of Data mining; Trends in Data mining.

Text Books:

1. *Introduction to Data Mining* - **Pang-Ning Tan**, **Michael Steinbach**, **Vipin Kumar**: Pearson Education, 2007.
2. *Data Mining: Concepts and Techniques***: Jiawei Han**, **Micheline Kamber** and Jian Pei, Third Edition, Morgan Kaufmann Publisher, 2012.

Reference Book:

1. **Data Mining Techniques -** Arun K Pujari, Universities Press (India) Limited

IS640 MANAGEMENT INFORMATION SYSTEM

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain the usage of Information Systems in management.
CO2: Apply ERP, CRM and Data warehouses techniques to solve problems.
CO3: Demonstrate the applications of Management Information System.

Foundation concepts **10 Hrs**

Information Systems in Business: Introduction, The real world of Information Systems, Networks, What you need to know, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT. System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems. Fundamentals of strategic advantages: Strategic IT, Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering business processes, Becoming an agile company Creating a virtual company, Building a knowledge-creating company.

Electronic & Enterprise business systems **10 Hrs**

Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems, Enterprise collaboration systems. Functional Business Systems: Introduction, Marketing systems, Manufacturing systems, Human resource systems, Accounting systems, Financial management systems. Customer relationship management: Introduction, What is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM. Enterprise resource planning: Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP. Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM.

Electronic commerce & Decision support systems **10 Hrs**

Electronic commerce fundamentals: Introduction, The scope of e-commerce, Essential ecommerce, processes, and Electronic payment processes. e-Commerce applications and issues: E-commerce application trends, Business-to-Consumer e-commerce, Web store requirements, Business-to-Business e-commerce, e-commerce marketplaces, Clicks and bricks in ecommerce. Decision support in business: Introduction, Decision support trends, Decision support systems (DSS), Management Information Systems, On-line analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support, Knowledge management systems, Business and Artificial Intelligence (AI), An overview of AI, Expert systems.

SECURITY AND ETHICAL CHALLENGES **10 Hrs**

Security, Ethical and societal challenges of IT: Introduction, Ethical responsibility of business professionals, Computer crime, Privacy issues, Other challenges, Health issues, Societal solutions. Security management of IT: Introduction, Tools of security management, Internetworked security defenses, Other security measures, System Controls and audits.

ENTERPRISE AND GLOBAL MANAGEMENT OF IT **10 Hrs**

Managing IT: Business and IT, Managing IT, Business / IT planning, Managing the IS function, Failures of IT management. Managing global IT: The International Dimension, Global IT Management, Cultural, Political and Geo - Economic challenges, Global Business/ IT strategies, Global Business / IT applications, Global IT Platforms, Global data access issues, Global Systems development.

Text Book:

1. **Management Information Systems -** James A. O' Brien, George M. Marakas, 10th Edition, Tata McGraw Hill, 2013

Reference Books:

1. **Management Information System, Managing the Digital Firm -** Kenneth C. Laudon and Jane P. Laudon, 9th Edition, Pearson Education, 2006.
2. **Information Systems The Foundation of E-Business –** Steven Alter, 4th Edition, Pearson Education, 2002.
3. **Management Information Systems -** W.S. Jawadekar, Tata McGraw Hill 1998.

IS 651 ADVANCED DATABASE SYSTEMS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:

CO1: Explain data storage, indexing structures, security and physical design of database systems.

CO2: Apply the concepts of data mining and information retrieval techniques.

CO3: Illustrate the different data models to infer the outcome of models.

Data Storage, Indexing, Query Processing, and Physical Design 10 Hrs

Introduction, Secondary Storage Device, Buffering Blocks, Placing File Records on Disks, Operation on Files, Files of unordered Records (Heap Files), Files of Ordered Records (Sorted Files) , Hashing Techniques, other Primary File Organizations Etc

Indexing Structures for Files: Types of single -Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B Trees and B+ Trees, Indexes on Multiple Keys, Other Types of Indexes.

Security, Advanced Modelling and Distribution 10 Hrs

Introduction to database Security Issues, Discretionary Access Control Based on Granting and Revoking Privileges, Mandatory Access Control and Role-Based Access Control for Multilevel Security, Statistical Database security, Flow Control, Encryption and Public Key Infrastructures, Privacy Issues and Preservation Challenges in database security.

Parallel Databases: 10 Hrs

Introduction; I/O Parallelism; Interquery parallelism; Intraquery parallelism; Intraoperation parallelism; Interoperation parallelism; Design of parallel systems.

Distributed Databases: Homogeneous and heterogeneous databases; Distributed storage; Distributed transactions; Concurrency control in distributed databases; Availability; Distributed query processing; Heterogeneous distributed databases; Directory systems.

Data Mining & Information Retrieval: 10 Hrs

Decision-support systems; Data analysis and OLAP; Data Warehousing; Data mining; **Overview of information retrieval;** Basic Concepts ; Boolean Model; Vector Model; Probabilistic Model; Retrieval Evaluation: Precision & Recall and Alternative Measures; Relevance ranking using terms; Relevance using hyperlinks; Synonyms, Homonyms, and Ontologies; Indexing of documents; Web search engines; Information retrieval and structured data; Directories.

Enhanced Data Models for Some Advanced Applications: 10 Hrs

Object oriented database, Active database and triggers, Temporal, Spatial, and Deductive Databases. **More Recent Applications:** Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.

Text Book:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007.

Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
2. Connolly and Begg: Database Systems, 4th Edition, Pearson Education, 2005.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition, McGraw Hill, 2010.

IS652 HUMAN COMPUTER INTERACTIONS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain the fundamentals of human computer interaction and paradigms for interaction
CO2: Develop the design and evaluation methodologies for HCI
CO3: Explore the knowledge of HCI models and theories to real-world applications

Introduction **10 Hours**

The Human: Input output channels, Design Focus: Getting noticed, Design Focus, Human memory, Design Focus, Thinking: reasoning and problem solving, Design Focus: Human error and false memories, Emotion, Individual differences, Psychology and the design of interactive systems. The Computer: Numeric keypads, Text entry devices, Positioning, pointing and drawing, Display devices, Hermes: a situated display, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Smart-Its making sensors easy, Paper: printing and scanning, Readability of text, Memory, Processing and networks, The myth of the infinitely fast machine. The Interaction: Models of interaction, Video recorder, Frameworks and HCI, Ergonomics, Industrial interfaces, Interaction styles, Elements of the WIMP interface, Interactivity, The context of the interaction

Paradigms and HCI Software Process **10 Hours**

Paradigms: Paradigms for interaction; Design process, Interaction design basics: The process of design, User focus, Design Focus: Cultural probes, Navigation design, Design Focus: Beware the big button trap, Modes, Screen design and layout, Alignment and layout matter, Checking screen colors, Iteration and prototyping
HCI in the software process: The software life cycle, Usability engineering, Iterative design and prototyping, Design Focus: Prototyping in practice, Design rationale

Rules & Evaluation Techniques **10 Hours**

Design rules: Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns. Implementation support: Elements of windowing systems, Programming the application, Design Focus: Going with the grain, using toolkits, Design Focus: Java and AWT, User interface management systems. Evaluation techniques: What is evaluation? Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, choosing an evaluation method.

Designs **10 Hours**

Universal design: Universal design principles, Multi-modal interaction, Designing websites for screen readers, choosing the right kind of speech, Apple Newton, Designing for diversity, Mathematics for the blind. User support: Requirements of user support, Approaches to user support, Adaptive help systems, Design Focus: It's good to talk help from real people, designing user support systems. Dialog notations and design: What is dialog?, Dialog design notations, Diagrammatic notations, Design Focus: Using STNs in prototyping, Design Focus: Digital watch documentation and analysis, Textual dialog notations, Dialog semantics, Dialog analysis and design.

Models & Theories **10 Hours**

Models and theories: Cognitive models, Goal and task hierarchies, Design Focus: GOMS saves money, Linguistic models, the challenge of display-based systems, Physical and device models, Cognitive architectures. Communication and collaboration models: Face-to-face communication, Design Focus: Looking real Avatar Conference, Conversation, Text-based communication, Group working, Interaction models, Continuous behavior
Modeling rich interaction: Status-event analysis, Rich contexts, Low intention and sensor-based interaction, Design Focus: Designing a car courtesy light, Hypertext, multimedia and the world wide web, Understanding hypertext, Finding things, Web technology and issues, Static web content, Dynamic web content.

Text Book:

1. Human Computer Interaction, 3rd Edition, Alan Dix, Janet Finlay, Gregory Abowd, Pearson Education Limited, 2014.

Reference Books:

1. Essence of Human Computer Interaction, Christine Faulkner, Pearson Education Limited, 2011.
2. Human Computer Interaction, K Meena, R Sivakumar, Prentice-Hall of India Pvt Ltd, 2015.

IS653 SOFT COMPUTING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain the fundamentals of Soft Computing Techniques
CO2: Design and evaluation methodologies of soft computing techniques
CO3: Explore the knowledge of soft computing techniques to real-world applications

Neural Networks **10 Hours**

History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

Fuzzy Logic **10 Hours**

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations .Fuzzy Numbers, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

Artificial Intelligence **12 Hours**

AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation. Searching: Searching for solutions, uniformed search strategies, Heuristic functions. Constrain satisfaction problems: Game Playing Alpha-Beta pruning, Evaluation functions, cutting of search, Knowledge Representation & Reasons logical Agents, logic, propositional logic, Resolution patterns in propositional logic, Resolution, Forward & Backward Chaining, Planning – Classical panning problem, Language of planning problems, Expressiveness and extension, planning with state.

Genetic Algorithms: **10 Hours**

An Overview, GA in problem solving, Implementation of GA, Genetic Algorithms: survival of the fittest principle in Biology, Genetic Algorithms, Significance of Genetic operators, termination parameters, Evolving Neural nets, Ant Algorithms.

Applications of Soft Computing **8 Hours**

Optimization of TSP using GA approaches, GA based Internet Searching

Techniques, Soft Computing based Hybrid Fuzzy Controller, Soft computing based Rocket Engine Control.

Text Books:

1. Principles of Soft Computing, S N Sivanandam and S N Deepa, Wiley Publishers, 2nd Edition, 2017

2. Stuart Russel, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, PHI/Pearson Education.

Reference Books:

1. Hertz J. Krogh, R.G. Palmer: Introduction to the Theory of Neural Computation, Addison-Wesley, 1991.

2. G.J. Klir & B. Yuan: Fuzzy Sets & Fuzzy Logic, PHI, 1995.

3. 4. Patrick Henry Winston, “Artificial Intelligence” , 3rd Edition, Pearson Education.

5. Melanie Mitchell: An Introduction to Genetic Algorithm, PHI, 1998.

IS654 COMPUTER VISION

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1:Explain the fundamentals of computer vision
CO2:Analyze different image representation models
CO3:Apply the knowledge of feature analysis in solving computer vision problems

Introduction to computer vision and image processing **10 Hrs**

Image formations: image representation and image analysis task, why are computer vision difficult, image digitization, digital image properties, color images, cameras a perspective. Image it's mathematical and physical background: linear integral transform, image as a stochastic process, image formation physics

Data structure for image analysis **15 Hrs**

Level of image representation, traditional image structures, hierarchical data structures. Image pre-processing: pixel brightness transformation, geometric transformation, local pre-processing, image restoration

Image segmentation **15 Hrs**

Thresholding, edge-based segmentation, region-based segmentation, matching, evaluation issues in segmentation, mean shift segmentation, active contour, geometric deformable models, fuzzy connectivities, 3D based image segmentation, graph cuts

Shape representation and description **10 Hrs**

Region identification, contour-shape based representation and descrition, region based shape representation, shape classes

Text Book:

1. Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis, and Machine Vision, Cengage Learning,2014.

Reference Books:

1. Richard Szeliski, "Computer vision algorithms and applications", Springer,2010
2. Anup Basu, Xiaobo Li., "computer vision system, theory, and applications", world scientific, 1993

IS710 DISTRIBUTED COMPUTING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes (CO):

On successful completion of the course, students should be able to:
CO1: Explain the design issues and underlying principles of distributed systems
CO2: Apply process/processor scheduling algorithms in distributed and real time systems
CO3: Analyze the concepts of distributed file systems and shared memory in distributed systems

Introduction to distributed systems **10 Hours**

Distributed systems, goals, hardware/ software concepts, design issues. Communications in distributed systems, layered protocols, ATM networks, Client-server models, RPC, group communications

Synchronization in distributed systems: **10 Hours**

Clock synchronization, mutual exclusion, election algorithms, atomic transaction, deadlocks in distributed systems.

Processes and Processors in distributed systems. **10 Hours**

Threads, system models, processor allocation, scheduling in distributed systems, fault tolerance, real time distributed system

Distributed file systems **10 Hours**

Design, implementation, trends in distributed file system.

Distributed shared memory **10 Hours**

Introduction, shared memory, consistency models, page based distributed shared memory, shared variable distributed shared memory, object based distributed shared memory.

Text Book:

1. *Distributed Operating System*, Andrew Tannenbaum, Pearson, 2008

Reference Books:

1. Distributed Concepts & Systems, Pradeep K Sinha, PHI Editions
2. Distributed Systems: Concepts and Design, 5/e, George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, Addison-Wesley, 2011.

IS720 INFORMATION AND NETWORK SECURITY

Total Teaching hours: 50 **No. of credits: 05**

Course outcomes

On successful completion of the course, students should be able to:
CO1: Explain the concept of information and security.
CO2: Illustrate packet/traffic analysis concepts and protocol format, Analyze the working of Network Security Devices
CO3: Design Internet Security models from the packet flow aspect, Categorize web security requirements.

Introduction to Information Security and Technology **10 Hours**

Planning for Security: Introduction; Information Security Policy, Standards, and Practices; The Information Security Blue Print; Contingency plan and a model for contingency plan Security Technology-1: Introduction; Physical design; Firewalls; Protecting Remote Connections

IDS and Cryptography **10 Hours**

Security Technology – 2: Introduction; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools. Cryptography: Introduction; A short History of Cryptography; Principles of Cryptography; Cryptography Tools; Attacks on Cryptosystems.

Introduction to Network Security, Authentication Applications **10 Hours**

Introduction to Network Security, Authentication Applications: Attacks, services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs Kerberos, X.509 Directory Authentication Service.

Electronic Mail Security and IP Security **10 Hours**

Electronic Mail Security: Pretty Good Privacy (PGP); S/MIME **,** IP Security**:** IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

Web Security **10 Hours**

Web Security: Web security requirements; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET)

Text Books:

1. Michael E. Whitman and Herbert J. Mattord: *Principles of Information Security*, 2nd Edition, Cengage Learning, 2005. (Chapters 5, 6, 7, 8)
2. William Stallings: *Network Security Essentials: Applications and*

Standards, 3rd Edition, Pearson Education, 2007 (Chapters: 1, 4, 5, 6, 7, 8)

Reference Book:

1. Behrouz A. Forouzan: *Cryptography andours Network Security*, Special Indian Edition, Tata McGraw-Hill, 2007.

IS730 INFORMATION RETRIEVAL

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to: :
CO1: Discuss various Information Retrieval (IR) models
CO2: Demonstrate data attributes, operations and design of indexing and searching algorithms.
CO3: Design User Interfaces and visualization techniques for searching the web

Introduction: 10 Hrs

Motivation, Basic concepts, Past, present, and future, The retrieval process. **Modeling:** Introduction, A taxonomy of information retrieval models, Retrieval: Adhoc and filtering, A formal characterization of IR models, Classic information retrieval, Alternative set theoretic models, Alternative algebraic models, Alternative probabilistic models, Structured text retrieval models, Models for browsing.

Retrieval Evaluation: 10 Hrs

Introduction, Retrieval performance evaluation, Reference collections. **Query Languages:** Introduction, keyword-based querying, Pattern matching, Structural queries, Query protocols.
Query Operations: Introduction, User relevance feedback, Automatic local analysis, Automatic global analysis.

Text and Multimedia Languages and Properties: 10 Hrs

Introduction, Metadata, Text, Markup languages, Multimedia. **Text Operations:** Introduction, Document preprocessing, Document clustering, Text compression, comparing text compression techniques.

Indexing and Searching 10 Hrs

Introduction; Inverted Files; Other indices for text; Boolean queries; Sequential searching; Pattern matching; Structural queries; Compression. **Parallel and Distributed IR:** Introduction, Parallel IR, Distributed IR.

User Interfaces and Visualization: 10 Hrs

Introduction, Human-Computer interaction, The information access process, Starting pints, Query specification, Context, Using relevance judgments, Interface support for the search process.
Searching the Web: Introduction, Challenges, Characterizing the web, Search engines, Browsing, Metasearchers, Finding the needle in the haystack, Searching using hyperlinks.

Text Books:

1. Ricardo Baeza-Yates, Berthier Ribeiro-Neto: *Modern Information Retrieval,* Pearson, 1999.

Reference Books:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze: *Introduction to Information Retrieval,* Publisher Cambridge University Press, 2007
2. David A. Grossman, Ophir Frieder: *Information Retrieval Algorithms and Heuristics*, 2nd Edition, Springer, 2004.

IS741 CLOUD COMPUTING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Illustrate the fundamentals and essentials of cloud computing.
CO2: Identify appropriate design choices for solving cloud computing problems and manage the various aspects of cloud system.
CO3: Describe cloud virtualization technologies and Achieve complex solutions driven by Service Oriented Architecture.

Introduction **10 Hours**

Business and IT perspective, Cloud and virtualization, Cloud services requirements, cloud and dynamic infrastructure, cloud computing characteristics, cloud adoption.

Cloud models

Cloud characteristics, Measured Service, Cloud models, security in a public cloud, public verses private clouds, cloud infrastructure self service.

Cloud at a service **10 Hours**

Gamut of cloud solutions, principal technologies, cloud strategy, cloud design and implementation using SOA, Conceptual cloud model, cloud service demand.

Cloud solutions

Cloud ecosystem, cloud business process management, cloud service management, cloud stack, computing on demand, cloud sourcing.

Cloud offerings **10 Hours**

Cloud analytics, Testing under cloud, information security, virtual desktop infrastructure, Storage cloud.

Cloud management: Resiliency, Provisioning, Asset management, cloud governance, high availability and disaster recovery, charging models, usage reporting, billing and metering.

Cloud virtualization and SOA **10 Hours**

Cloud virtualization technology: Virtualization defined, virtualization benefits, server virtualization, virtualization for x86 architecture, Hypervisor management software, Logical partitioning, VIO server, Virtual infrastructure requirements**.** Storage virtualization, storage area networks, network attached storage, cloud server virtualization, virtualized data center.

Cloud and SOA: **10 Hours**

SOA journey to infrastructure, SOA and cloud, SOA defined, SOA defined, SOA

and IAAS, SOA based cloud infrastructure steps, SOA business and IT services.

Text Book:

1. Cloud Computing by Dr. Kumar Saurabh, Wiley India, 2011.

Reference Books:

1. Michael Miller*, Cloud Computing: Web based applications that change the way you work and collaborate online*, Que publishing , August 2009
2. Haley Beard, *Cloud Computing Best Practices for Managing and Measuring Processes for On Demand computing applications and data Centers in the Cloud* with SLAs, Emereo Pty Limited, Jul

IS742 CYBER SECURITY

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Identify the different classifications of cybercrimes and offences.
CO2: Elaborate challenges in mobile devices and identify the different attacks.
CO3: Explain phishing in cybercrime and the Indian IT Act.

Introduction 10 Hours

Introduction to cybercrime, Cybercrime and information security, Who are Cybercriminals, Classification of Cybercrimes, Cybercrime: The Legal Perspectives, An Indian Perspective**,** Cybercrime and the Indian ITA 2000, A global perspective on cybercrimes, Cybercrime era: Survival mantra for the citizens.

Cyber offenses 10 Hours

Introduction, How criminal plan the attacks, Social engineering, Cyber stalking, Cybercafe and cybercrimes, Botnets: The fuel for cybercrime, Attack vector, Cloud Computing.

Cyber crime: Mobile and Wireless devices 10 Hours

Introduction, Proliferation of mobile and wireless devices, Trends in mobility, Security challenges posed by mobile devices, Registry setting for mobile devices, Authentication service security, Attacks on mobile/ cell phones, Mobile devices: security implications for organizations, Organization measures for handling mobile, Organizational security policies and measures in mobile computing era, Laptops.

Tools and method used in Cybercrime 8 Hours

Introduction, Proxy servers and anonymizers, Phishing, Password cracking, Key loggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL injection, Buffer overflow, Attacks on wireless networks.

Phishing and identity theft 12 Hours

Introduction, Phishing, Identity theft (id theft).

Cybercrimes and Cyber Security: The legal perspectives

Introduction, Cybercrime and the legal landscape around the world, Why do we need cyber laws: the Indian context, The Indian IT Act, Challenges to Indian law and cybercrime scenario in India, Consequences of not addressing the weakness in information technology act.

Text Book:

1. Cyber Security by Nina Godbole,Sunit Belapure, Wiley India, 1st edition copyright 2011 reprint 2013.

Reference Books:

1. Computer Forensics and Cyber Crime An Introduction by Marjie T. Britz , Pearson publication, 2nd edition.

IS743 INTERNET OF THINGS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain the appropriate APIs, models and enabling technologies required to develop IoT applications.
CO2: Analyze the wireless and IPV6 technologies for IoT applications.
CO3: Develop and demonstrate IoT solutions for data Analysis using Apache Hadoop MapReduce

Introduction **10 Hours**

Introduction to Internet of Things: Introduction: Definition and Characteristics of IoT, Physical Design of IoT: Things in IoT, IoT Protocols, Logical Design of IoT: IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication protocols, Communication Protocols, Embedded Systems, IoT Levels and Deployment Templates Internet of Things Applications: Introduction, Home Automation, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Smart Cards, Tracking, Surveillance system, Environment, Energy, Retail, Logistics, Agriculture, Industry and Health care and Lifestyle

Design using Phyton **10 Hours**

IoT Systems Logical Design using Python: Introduction, Installing Python, Data types and Data structures, Control flow, Functions, Modules, Packages, File handling, Classes, Python packages for IoT. IoT device, Exemplary Device: Raspberry Pi, about the board, Linux on Raspberry Pi, Raspberry Pi Interfaces, and Programming Raspberry Pi with Python

Layer Connectivity **10 Hours**

Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer 3 Connectivity :IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities, IPv6 Tunneling, IPsec in Ipv6,Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.

Data Analytics for IoT **10 Hours**

Data Analytics for IoT – Introduction, Apache Hadoop, MapReduce Programming Model, Hadoop MapReduce Job Execution, MapReduce Job Execution workflow, Hadoop Cluster Setup, Starting and Stopping Hadoop Cluster Using Hadoop MapReduce for Batch Data Analysis.

Applications of IoT **10 Hours**

Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications using different IoT devices, platform and software.

Text Books:

1. Daniel Minoli, ”Building the Internet of Things with IPv6 and MIPv6:The Evolving world of M2M Communications”, Wiley, 2013
2. Arshdeep Bahga, Vijay Madisetti, ”Internet of Things : A Hands on Approach” Universities Press., 2015

Reference Books:

1. Michael Miller, The Internet of Things”, First Edition, Pearson, 2015.
2. Claire Rowland,Elizabeth Goodman et.al.,” Designing Connected Products”, First Edition,O’Reilly, 2015

IS744 ROBOTICS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO-1: Explain the fundamentals of robotics and navigation.
CO-2: Implement the Kinematics concepts and apply the suitable image processing algorithms.
CO-3: Integrate image processing and Robotic control techniques

10 Hours

Representing position & orientation: Pose in 2-dimensions, Pose in 3-dimensions, Orthonormal rotation matrices, homogeneous transformation matrices, Euler angles, roll-pitch-yaw angles, gimbal lock, quaternions. **Time & motion Trajectories:** 1-dimensional, multi-dimensional, multi-segment, Interpolation of rotation, Smooth Cartesian motion, Time-varying coordinate frames, angular velocity, Inertial navigation solution.

10 Hours

Mobile Robot Vehicles: Mobility, Car-like vehicles, moving to a point, line & pose, Flying robots. **Navigation**: Reactive navigation, Braitenberg vehicles, Bug* automata, Distance transform, D*Roadmap methods: Voronoi, PRM, RRT Localization EKF-based dead reckoning Map based Creating a map Localization & mapping Monte-Carlo approach.

10 Hours

Kinematics: Forward kinematics, Inverse kinematics, Trajectories Assigning Denavit-Hartenberg parameters, Applications. Velocity relationships Manipulator Jacobians, Resolve-rate motion control Force relationships, Under and over actuated manipulators, **Dynamics & Control**: Independent Joint control, Rigid body equations of motion: gravity, inertia, Coriolis Forward dynamics, Rigid body dynamics compensation.

10 Hours

Computer Vision Fundamentals: Light & color Spectral representation of light Color, color spaces, color gamut, color consistency, White balance Gamma Image formation Perspective imaging, calibration Fisheye, catadioptric & unified imaging **Image processing**: Acquiring images from files, cameras and the web, Image histograms, Monadic operation, Diadic operations, Spatial operations: convolution, template matching, rank filtering Morphology: image cleanup, skeletonization, hit-or-miss transform Shape changing: cropping, resizing, warping, pyramids.

10 Hours

Image feature extraction: Region features: segmentation, thresholding, MSER, graph-based Line features: Hough transform Point features: Harris, SURF. **Using multiple images:** Fundamental & essential matrix, estimation & RANSAC

Homographies Dense stereo, rectification ICP and plane fitting, Examples: perspective undistortion, mosaicing, image retrieval. **Visual Serving**: Position-based visual servoing (PBVS), Image feature motion due to camera motion, Controlling feature motion - image-based visual servoing (IBVS), estimating depth, Performance issues and failure modes, Servoing using line and ellipse features.

Text Books:

1. Peter Corke, Robotics, Vision and Control: Fundamental Algorithms In MATLAB, Second Edition, Springer, 2017
2. Mark Spong, M. Vidyasagar, Robot Dynamics and Control, Wiley Student Edition 2004.

Reference Book:

1. R. K. Mittal and I. J. Nagarath: *Robotics and Control,* 6th Reprint, Tata Mcgraw-Hill Education, Delhi 2007.

IS751 MOBILE COMPUTING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain the working principles of mobile communication system
CO2: Analyze the concepts of mobility and location based services for improved advancements.
CO3: Illustrate the underlying technology behind mobile application languages.

Mobile Devices and Systems, Architectures **12 Hours**

Mobile phones, Digital Music Players, Handheld Pocket Computers, Handheld Devices, Operating Systems, Smart Systems, Limitations of Mobile Devices, Automotive Systems. GSM – Services and System Architectures, Radio Interfaces, Protocols, Localization, Calling, Handover, General Packet Radio Service.

Wireless Medium Access Control and CDMA – based Communication **08 Hours**

Medium Access Control, Introduction to CDMA – based Systems, OFDM Databases: Database Hoarding Techniques, Data Caching, Client – Server Computing and Adaptation, Transactional Models, Query Processing, Data Recovery Process, Issues relating to Quality of Service.

Mobile IP Network Layer, Mobile Transport Layer **10 Hours**

IP and Mobile IP Network Layers Packet Delivery and Handover Management, Registration, Tunneling and Encapsulation, Route Optimization, Dynamic Host Configuration Protocol. Indirect TCP, Snooping TCP, Mobile TCP, Other Methods of TCP – layer Transmission for Mobile Networks.

Mobile Devices, Server and Management **10 Hours**

Mobile agent, Application Server, Gateways, Portals, Service Discovery, Device Management, Mobile File Systems. Wireless LAN (WiFi) Architecture and Protocol Layers, WAP 1.1 and WAP 2.0 Architectures, Bluetooth – enabled Devices Network, Zigbee.

Mobile Application languages – XML, Java, J2ME and JavaCard, Mobile Operating Systems **08 Hours**

Introduction, XML, JAVA, Java 2 Micro Edition (J2ME), Java Card. Operating System, PalmOS, Windows CE, Symbian OS, Linux for Mobile Devices.

Text Book:

1. Mobile Computing - Raj Kamal, Oxford University Press, 2007.

Reference Books:

1. Mobile Computing – Technology, Applications and Service Creation- Talkukder, Roopa R Yavagal Tata McGraw Hill, 2005.Asoke
2. Principles of Mobile Computing - Uwe Hansmann, Lothat Merk, Martin S Nicklous and Thomas Stober, 2nd Edition, Springer International Edition, 2003.
3. Mobile Communication - Schiller, Pearson Publication, 2004.

IS752 C # PROGRAMMING & .NET

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Illustrate integrated development environment and recognize features of object-oriented designs.
CO2: Design and develop applications using C# core features.
CO3: Develop GUI based applications with distributed data-driven applications.

Introduction to Microsoft Visual C# Programming **10 hours**

Introduction to Microsoft Visual C# Programming: A Demonstration of Visual C# 2008, Common Elements in Visual C# 2008,C# Core Language Features.
Types: Classes, structures, Enumeration, Equivalence versus identity, Class Refinement. Inheritance: Example, System. Object, Employee Class, Implementing Inheritance, Overriding Inherited Behaviors, The new Modifiers, Constructors and Destructors, Interfaces, Polymorphism, Casting.

Arrays and Collections in Visual Studio **10 hours**

Introduction to Visual Studio 2008: Integrated Development Environment, Class Hierarchies, Code Editor, Code snippets Arrays and Collections: Arrays, Collections. Generics: Generic Types, Generic Methods, Constraints, Casting, Inheritance, static members Enumerators: Enumerable objects, Generic Enumerators, Iterators.

Overloading, Delegates and Events **10 hours**

Operator Overloading: Mathematical and Logical operators, conversion operators, operator overloading internals Delegates and Events: Delegates, Anonymous Methods, Events. Exception Handling: Structured Exception Handling, System Exception, Remote Exceptions, Unhandled Exceptions, Managing Exceptions in Visual Studio.

WIN Forms **10 hours**

WIN FORMS: Simple Widows Application, MDI Application, Working with new Windows controls

ADO.Net Features **10 hours**

ADO.NET FEATURES: The ADO.NET Object Model, Connecting to Data, Understanding Connection Pooling, Using Provider Statistics, Retrieving Data, Introducing Command Classes, Working with Data Readers, Populating a DataTable, Filling Datasets Using a Data Adapter, Working with Data Tables, Working with Data Views.

Text Book:

1. Programming Microsoft Visual C# 2008: The Language, Donis Marshall, Microsoft Press, 2008
2. C# Programming : From problem Analysis to program design, Barbara Doyle, II edition, Cengage learning.

Reference Books:

1. Pro C# with .NET 3.0, Andrew Troelsen, Special Edition, Dream tech Press, India, 2007.
2. Inside C#, Tom Archer, WP Publishers, 2001.
3. The Complete Reference C#, Herbert Schildt, Tata McGraw Hill, 2004.
4. Programming in C++,E Balaguruswamy, A Primer Second Edition,TMH 2009

IS753 NATURAL LANGUAGE PROCESSING

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:

CO1: Design finite state transducers for Language Processing.

CO2: Build applications for NLP using machine learning algorithms.

CO3: Illustrate the various aspects of natural language generation.

Introduction **10 Hours**

Introduction to NLP: Definition, Knowledge in speech and speech language processing, Word Classes: Review of Regular Expressions, Morphology: Inflectional, derivational, parsing and parsing with FST, Combining FST lexicon and rules, human morphological processing.

Phonology: **10 Hours**

Speech sounds, phonetic transcription, phoneme and phonological rules, optimality theory, machine learning of phonological rules, phonological aspects of prosody and speech synthesis. Pronunciation, Spelling and N-grams: Spelling errors, detection and elimination using probabilistic models, pronunciation variation (lexical, allophonic, dialect), decision tree model, counting words in Corpora, simple N-grams, smoothing (Add One, Written-Bell, Good-Turing), N-grams for spelling and pronunciation.

POS Tagging: **10 Hours**

Tag sets, concept of HMM tagger, rule based and stochastic POST, algorithm for HMM tagging, transformation based tagging, Sentence level construction & unification: Noun phrase, co-ordination, sub-categorization, concept of feature structure and unification. 3L

Lexical Semantics and Word Sense Disambiguation **10 Hours**

Semantics: Representing Meaning: Unambiguous representation, canonical form, expressiveness, meaning structure of language, basics of FOPC, semantics of FIPC. Semantic Analysis**:** Syntax driven, attachment & integration, robustness. Lexemes (homonymy, polysemy, synonymy, hyponymy), WordNet, internal structure of words, creativity and the lexicon: metaphor and metonymy and their computational approaches. Word Sense Disambiguation: Selectional restriction-based, machine learning based and dictionary based approaches.

Pragmatics: **10 Hours**

Discourse: Reference resolution and phenomena, syntactic and semantic constraints on Co reference, pronoun resolution algorithm, text coherence, discourse structure. Dialogues: Turns and utterances, grounding, dialogue acts

and structures. Natural Language Generation: Introduction to language generation, architecture, discourse planning, text schemata, rhetorical relations.

Text Book:

1. D. Jurafsky & J. H. Martin – "*Speech and Language Processing* – An introduction to Language processing, Computational Linguistics, and Speech Recognition", Pearson Education

Reference Books:

1. Allen, James. 1995. – *Natural Language Understanding*. Benjamin/Cummings, 2ed.Bharathi, A Vineet Chaitanya and Rajeev Sangal. 1995.
2. Natural Language *Processing- A Pananian Perspective*. Prentice Hll India, Eastern Economy Edition. Eugene Cherniak:
3. Chris Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing, MIT Press. Cambridge, MA: May 1999.

IS754 INTERNET PROGRAMMING

Total Teaching hours: 50 **No. of credits: 05**

On successful completion of the course, students should be able to:
CO1: Illustrate the concepts of static and dynamic web pages
CO2: Demonstrate interaction between client and server side applications
CO3: Design and develop web service based applications

An overview of Java: **09 Hrs**

Data Types – Variables and Arrays – Operators – Control Statements – Classes – Objects – Methods – Inheritance - Packages – Abstract classes – Interfaces and Inner classes – Exception handling - Introduction to Threads – Multithreading – String handling – Streams and I/O – Applets.

Web 2.0: **10 Hrs**

Basics-RIA Rich Internet Applications - Collaborations tools - Understanding websites and web servers: Understanding Internet – Difference between websites and web server- Internet technologies Overview –Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0 , XHTML, CSS 3.
.

Client side and Server side Programming: **10 Hrs**

An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling-DHTML with JavaScript. Servlets: Java Servlet Architecture- Servlet Life Cycle-Form GET and POST actions- Session Handling- Understanding Cookies-Installing and Configuring Apache Tomcat Web Server DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library(JSTL)-Creating HTML forms by embedding JSP code.

PHP and XML: **09 Hrs**

An introduction to PHP: Using PHP- Variables- Program control- Built-in functions-Connecting to Database – Using Cookies-Regular Expressions; XML: Basic XML-Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

Introduction to AJAX and WEB Services: **10 Hrs**

Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing ,Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

Text Books:

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall,5th Edition, 2011.
2. Herbert Schildt, “Java-The Complete Reference”, Eighth Edition, Mc Graw Hill Professional,2011.

Reference Books:

1. Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications,2009.

IS811 STORAGE AREA NETWORK

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Analyze storage needs on a variety of business and technological scales and select solutions to meet those needs
CO2: Assess the technical capabilities of a variety of storage technologies in light of business and technical needs to analyze, deploy and manage virtual machines..
CO3: Develop and implement migration strategies for growing business storage needs and network capabilities with description of a system backup and restoration

Introduction and Intelligent Disk Subsystems **10 Hours**

Server Centric IT Architecture and its Limitations; Storage - Centric IT Architecture and its advantages; Case study: Replacing a server with Storage Networks; The Data Storage and Data Access problem; The Battle for size and access.
Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal VO Channels, JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems; Availability of disk subsystems.

I/O Techniques: **10 Hours**

The Physical I/O Path from the CPU to the Storage System, SCSI, The Fibre Channel Protocol Stack, Fibre Channel SAN, **File System and NAS:** Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

Storage Virtualization: **10 Hours**

Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.

Application of Storage Networks: **10 Hours**

Definition of the Term ‘Storage Network’, Storage Sharing, Availability of Data, Adaptability and Scalability of IT Systems

Network Backup: **10 Hours**

General Conditions for Backup, Network Backup Services, Components of Backup Servers, Backup Clients, Performance Gains as a Result of Network Backup, Performance Bottlenecks of Network Backup, Limited Opportunities for

Increasing Performance, Next Generation Backup, Backup of File Systems, Backup of Databases

Text Book:

1. Storage Networks Explained, Ulf Troppens, Rainer Erkcns and Wolfgang Muller, John Wiley & Sons, 2009.

Reference Books:

1. Storage Area Network Essentials: A Complete Guide to understanding and Implementing SANs Richard Barker and Paul Massiglia, John Wiley India, reprint 2011.
2. Storage Networking Fundamentals, Marc Farley, CISCO Press, 2005.
3. Storage Networks - The Complete Reference, Robert Spalding, Tata McGraw Hill, 2003.

IS812 INFORMATION STORAGE MANAGEMENT

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Demonstrate components, methods and services of a data center.
CO2: Monitor storage infrastructure and management activities.
CO3: Evaluate storage architectures.

Introduction **10 Hrs**

Introduction to information storage management, Evolution storage technology, Data Centre Infrastructure, Key challenges in managing information, Data Centre Environment: Application, 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 Technologies **10 Hrs**

Fibre Channel: Overview ,SAN and its Evolution, Components of FC SAN, FC Connectivity, FC Architecture, IPSAN-iSCSI components, iSCSI Topologies, iSCSI Protocol Stack,iSCSI Names, NAS: 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.

BUSINESS CONTINUITY and BACK UP RECOVERY **10 Hrs**

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.

STORAGE SECURITY and MANAGEMENT **10Hrs**

Storage Security Framework and Domain, Monitoring the Storage Infrastructure: Monitoring Parameters, Components Monitored, Monitoring examples, Storage Infrastructure Management Activities, Storage Management Examples: Storage Allocation to a New Server/Host, File System Space Management.

Cloud Computing **10 Hrs**

Cloud Enabling Technologies: Characteristics of Cloud Computing, Benefits of Cloud Computing, Cloud Service Models, Cloud Deployment models, Cloud computing Infrastructure, Cloud Challenges.

Text Books:

1. EMC Corporation, “Information Storage and Management”, 2nd edition Wiley India, ISBN13: 978-1118094839
2. UifTroppen Rainer Wolfgang Muller,”Storage Networks Explained”, India, Wiley, 2010, ISBN13: 978-0470741436

Reference Books:

1. Robert Spalding,Storage Networks: The Complete Reference, Osborne, Tata McGraw Hill, 2003, ISBN-13: 978-0072224764
2. Farley,’Building Storage Networks”, Osborne, Tata McGraw Hill, 2009, ISBN-13: 978-0072130720
3. Meeta Gupta, Storage Area network Fundamentals, Pearson Education Limited,2002, ISBN13: 978-1587050657
4. Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, Fourth Reprint, Tata McGraw Hill Edition, 2010, ISBN-13: 978-0071626941

IS813 BIG DATA ANALYTICS

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:
CO1: Explain big data analytics and methods to create innovative analytics systems for big data
CO2: Apply big data technologies and tools to analyze the data
CO3: Apply data mining methods to analyze and solve complex big data problem

Introduction **10 Hours**

Overview of Big Data, History, Structuring Big Data, Types of Data, Elements of Big Data, Data analytics project life cycle, Problems & challenges in understanding Data Analytics, Web page categorization, computing the frequency of stock market change. Use of Big Data in Social Networking, Use of Big Data in preventing Fraudulent activities, Use of Big Data in Retail Industry.

Big Data Technology **10 Hours**

Exploring Big Data Stack, Virtualization, Virtualization Approaches, Distributed and parallel computing for Big Data, The cloud and Big Data, Cloud Deployment Models, Cloud Delivery Models, Cloud providers in Big Data Market. Introducing Hadoop, Hadoop Ecosystem, Hadoop Distributed File Systems(HDFS), Features of HDFS : Hadoop YARN, MAP Reduce, Features of Map Reduce, Working of Map Reduce, Techniques to Optimize Map Reduce Jobs, Uses of Map Reduce, HBase, Features of HBase, Role of HBase in Big Data processing, Other tools of Hadoop (Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, OOZie),

Mining Data Streams **10 Hours**

The Stream Data Model, A Data-Stream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing, Sampling Data in a Stream, Filtering Streams, Estimating Moments, Dealing With Infinite Streams, Counting Ones in a Window.

Frequent Itemsets **10 Hours**

The Market Basket Analysis, A Priori Algorithm, Handling Larger Datasets in Main Memory, Limited-Pass Algorithms, Counting Frequent Items in a Stream.

Recommendation Systems **10 Hours**

A Model, Content Based Recommendations, Collaborative Filtering, Dimensionality Reduction Problem, The NetFlix Problem.

Text Books:

1. Big Data: Black Book, DT Editorial Services, Dream Tech Press Publishers, 2015.
2. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeff Ullman, Second Edition, Cambridge University Press Publisher, 2015.

Reference Books:

1. Big Data Analytics with R and Hadoop, Vignesh Prajapati, Packt Publishing, 2013
2. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services, 2015.

IS821 FINANCIAL MANAGEMENT

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes:

After completion of the course, student will be able to:

CO1: Explain the functions of finance management

CO2: Apply the basic concepts which enable the financial decision making

CO3:Apply the concepts of financial management to contemporary financial events

Introduction to finance function **10 Hrs**

Financial Management – Introduction to finance, objectives of financial management – Firm Value and equity value– profit maximization and wealth maximization. Changing role of finance managers. Organization of finance function.
Agency model; problem and agency cost – Stockholders and Managers; bondholders and society - Disciplining management through corporate governance - Sustainability model. Limits of corporate finance. Introduction to Indian Financial System.

Compounding and discounting principle **10 Hrs**

Time value of money – Time Lines & notation, Future value of single cash flow & annuity, present value of single cash flow, annuity& perpetuity, Capital recovery factor and loan amortization schedule. Concepts of Risk and Return – Diversifiable and Non-Diversifiable risk - Risk& return of single asset, risk and Return of a portfolio, Measurement of market risk for single asset and portfolio.

Financing decision **10 Hrs**

Sources of long term funds: Cost of capital – basic concepts. Cost of debenture capital, cost of preferential capital, cost of term loans, cost of equity capital (Dividend discounting and CAPM model). Cost of retained earnings. Determination of Weighted average cost of capital (WACC) and Marginal cost of capital. Investment decisions: Basis of project cash flow estimation; hurdle rates for projects and firm. Estimating cash flow for new project, Cash flows of replacement projects Investment evaluation techniques – Net present value, Internal rate of return, Modified internal rate of return, Profitability index, Payback period, discounted payback period, Accounting rate of return.

Capital budgeting under uncertainty **10 Hrs**

Basic of constructing a decision tree. Simple problem on EMV and Decision making, Working capital management**,** Factors influencing working capital

requirements. Current asset policy and current asset finance policy. Determination of operating cycle and cash cycle. Estimation of working capital requirements of a firm. (Does not include Cash and Inventory Management)

Capital Structure **10 Hrs**

Capital structure decisions – Overview of financing choices –The financing process; internal and external financing - Planning the capital structure: EBIT and EPS analysis. ROI & ROE analysis. Capital structure policy(No capital structure theories to be covered)
Dividend policy – Factors affecting the dividend policy - dividend policies- stable dividend, stable playout.

Text Books:

1. Prasannachandra; Financial Management Theory and Practice; Tata McGraw Hill; 7th Edition
2. I.M. Pandey – Financial Management (Vikas), 9/e,
3. Brigham & Houston – Fundamentals of Financial Management, Thomson Cengage Learning, 1/e,

Reference Books:

1. M.Y. Khan & P.K. Jain – Financial Management (TMH), 5/e
2. Damodaran, Corporate Finance – John wiley & Co., 2/e, 2004
3. Vanhorne, Financial Management & Policy, Pearson / PHI, 11/e, 2002

IS822 ENTREPRENEURSHIP DEVELOPMENT

Total Teaching Hours: 50 **No. of Credits: 05**

Course Outcomes:

After completion of the course, student will be able to:

CO1: Explain the principles of entrepreneurship development

CO2: Develop basic entrepreneurial skills

CO3: Identify and establish business effectively and efficiently

ENTREPRENEURSHIP **10Hours**

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

MOTIVATION **10Hours**

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

BUSINESS **10Hours**

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

FINANCING AND ACCOUNTING **10Hours**

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

SUPPORT TO ENTREPRENEURS **10Hours**

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale

Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Text Books :

1. Khanka. S.S., “Entrepreneurial Development” S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko, “ Entreprenuership – Theory, Process and Practice”, 9th Edition, Cengage Learning 2014.

Reference Books:

1. Hisrich R D, Peters M P, “Entrepreneurship” 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J Manimala, “Enterprenuership theory at cross roads: paradigms and praxis” 2nd Edition Dream tech, 2005.
3. Rajeev Roy, ‘Entrepreneurship’ 2nd Edition, Oxford University Press, 2011.
4. EDII “Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development”, Institute of India, Ahmadabad, 1986.

IS823 HUMAN RESOURCE MANAGEMENT

Total Teaching hours: 50 **No. of credits: 05**

Course Outcomes

On successful completion of the course, students should be able to:

CO1: Identify the fundamentals of Human Resource Management

CO2: Apply the managerial skills for smooth running of the organization

CO3: Explore various dimensions of Human Resource Management, both as an academic discipline and as a professional practice.

Introduction to Managing Human Resource **8 Hours**

Nature and scope, features, functions, objectives, policies, procedures and Programs, practices, Line and staff responsibility, Roles and Responsibilities of managers.

HR Planning & Acquisition **12 Hours**

Human Resource Planning, Objectives, integration of strategic planning and HRP, benefits of HRP, factors affecting HRP, process, problems of HRP, Job design, Need, Approaches, Options, Process, Job Description, Job analysis process, benefits of job analysis. Recruitment - Objectives, Recruitment Policy – formulation, responsibilities, Policy design, factors influencing policy, Recruitment Process in detail, their importance and implications, Selection Process.

Training and Development **10 Hours**

Need, Forms and types, Training need analysis, Delivery Methodology, Evaluation. Capacity Building. **Performance Appraisal and Management:** Purpose, objectives, appraisers and different methods of appraisal, Potential Appraisals, limitations and problems of performance appraisal, Post Appraisal Analysis, 360 degree appraisal.

Compensation & Benefits Administration **10 Hours**

Compensation Management: need for sound salary administration, factors affecting wages/ salary levels, job evaluation, wage salary survey, salary structure, salary fixation, incentives, bonus concepts, ESOPs, pay for performance, Benefits administration, employee welfare and working conditions-statutory and voluntary measures. **Career Planning & Development:** Career – Stages in career Planning and Career development – Process.

Employee Separations, Downsizing & Outplacement **10 Hours**

Employee separation, types, costs of employee separation, benefits of employee separation, managing early retirements, managing layoffs, outplacement goals and services.**HR Accounting, Records, Audit, Research and Information:** Human Resource accounting, HR Records, HR Audit– Objectives, Needs, Process. HR Information System

Text Books:

1. Essentials of Human Resource Management and Industrial Relations, Himalaya Publication - Subba Rao –3rd Revised ,
2. Internal Audit – Roy Chowdhary Subject Title Human Resource Management

Reference Books:

1. Human Resource Management, Principles & Practice – Aquinas, Vikas Publication,
2. Managing Human Resources - Wayne F Cascio, TATA McGRAW-HILL- 7th , , 10th Chapter
3. Managing Human Resource - Luis R. Gomez-Mejia – Fourth , , Pearson Publication, 6th Chapter

IS824 SOFTWARE PROJECT PLANNING AND MANAGEMENT

Total Teaching Hours: 50 **No. of Credits : 05**

Lab hours/week: 02

Course Outcomes:

After completing this course, the students would be able to:
CO 1: Select the resources required for a project to produce a work plan and resource schedule.
CO 2: Apply appropriate management procedures, estimation techniques and quality control procedures at different phases in software development.
CO 3: Analyse the impact of applying procedures and practices during and after the development of software.

Process Models: **10 Hours**

Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process, Agile development. **Project management concepts:** The management spectrum, people, product, process, project, W^5HH principle. **Process and projecr metrics:** Metrics in the Process and Project Domains, Software measurement, Metrics for software quality, Integrating metrics within the software process, Metrics for small organisations, Establabshing a software metrics program.

Risk Management: **10 Hours**

Proactive versus reactive risk, Software risks, Risk identification, Risk projection, Risk refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan.

Software Process Improvement: Introduction, SPI Process, CMMI, The people CMM, Other SPI Frameworks, SPI Return on Investment.

Estimation for software projects: **10 Hours**

Observations on Estimation, The Project Planning Process, Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Specialised estimation techniques, Make/Buy decision.**Project Scheduling:** Basic concepts, Project scheduling, Defining the task set for software project, Defining a task network, scheduling, Earned value analysis.

Quality concepts: **10 Hours**

Software quality, Quality dilemma, Achieving Software Quality, **Software Quality assurance:** lements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Statistical Software Quality Assurance, Software reliabiality, The ISO 9000 Quality

Standards, The SQA plan. **Software Configuration Management:** Software Configuration Management, The SCM Repository, The SCM process, Configuration Management for Web and MobileApps.

Software Testing Strategies: **10 Hours**

A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Test Strategies for MobileApps, Validation Testing, System testing, Debugging. **Formal Modelling and Verification:** The Cleanroom Strategy, Functional Specification, cleanroom design, cleanroom testing, Rethinking Formal Methods, Formal Methods Concepts

Text Book:

1. Roger S. Pressman and Bruce R. Maxim, "Software Engineering A PRACTITIONER'S APPROACH ", Tata McGraw Hill, 8th edition, 2015.

Reference Books:

1. Watts Humphrey, "Managing the Software Process ", Pearson Education, New Delhi, 2000
2. Pankaj Jalote, "Software Project Management in Practice by Pankaj Jalote", Pearson Education, 2017.