ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ

University of Mysore

(Estd.1916)

M.Sc. COMPUTER SCIENCE

Choice Based Credit System (CBCS)

UNIVERSITY OF MYSORE

Department of Studies in Computer Science

Manasagangotri, Mysuru-570006

Regulations and Syllabus

Master of Computer Science (M.Sc. - M. Sc. Tech.)

(M. Sc. [Two-year] and M. Sc. Tech. [Three-year] semester scheme)

Under

Choice Based Credit System (CBCS)

UNIVERSITY OF MYSORE

GUIDELINES AND REGULATIONS LEADING TO

MASTER OF COMPUTER SCIENCE

(M.Sc. TWO-YEAR SEMESTER SCHEME)
(M. Sc. Tech. THREE-YEAR SEMESTER SCHEME)
UNDER CBCS

Programme Details

Name of the Department	:	Department of Studies in Computer Science
Subject	:	Computer Science
Faculty	:	Science and Technology
Name of the Programme	:	Master of Science in Computer Science (M.Sc.) Master of Technology in Computer Science (M. Tech)
Duration of the Programme	:	M.Sc. - 2 years divided into 4 semesters M. Sc. Tech - 3 years divided into 6 semesters

PROGRAMME OUTCOMES

- Graduates will acquire the knowledge about the current technology, trends, tools, theory of Computer Science and software development concepts to develop applications and to identify the potential problems where creative computer-based solutions can be applied to solve the problems.
- Graduates will be successful software professionals in IT industry capable of assimilating new information and understanding newer technology and its application domain to provide efficient and effective software solutions wherever possible.
- Graduates will inculcate the skills of communicating proficiently and collaborate successfully with peers, colleagues and organizations for higher studies, research and entrepreneurship to create new applications for the betterment of the society and their better future.

PROGRAMME SPECIFIC OUTCOMES

1. Understand theories and application of emerging technologies.
2. Expertise in computing enables students to solve complex, challenging problems.

PEDAGOGIES EMPLOYED IN THE M.SC., PROGRAMME

The pedagogy of teaching-learning involves three components.

- Lectures with intellectual inputs form the first component. This method provides Receptive Instructions to students.
- The second component is the tutorials. This method provides Directive Instructions to students.
- The third major component is the practical orientation with skills and participatory learning works. This method involves Exploratory Instructions.

SL.NO	COURSE CODE	COURSE TITLE	HC/ SC/ OE	L	T	P	CREDITS
1	19501	Discrete Mathematics	HC	3	1	0	4
2	19502	Principles of Programming & Problem Solving	HC	2	1	1	4
3		Data Structures	HC	2	1	1	4
4	19504	Computer Architecture	HC	2	1	1	4
5	19511	Algorithmics	HC	2	0	2	4
6	19513	System Software	HC	2	1	1	4
7		Operating System	HC	3	1	0	4
8	19521	Theory of Languages	HC	2	1	1	4
9	19522	Data Base Management System	HC	2	1	1	4
10	19512	Computer Networks	HC	2	1	1	4
11	19507	Computer Graphics	HC	2	1	1	4
12	19523	Software Engineering	HC	2	1	1	4
13		Object Oriented Analysis and Design	HC	2	2	0	4
		Softcore					
1	19531	Compiler Construction	SC	2	1	1	4
2	19514	Graph Theoretic Algorithms	SC	2	1	1	4
3	19515	Data Communications	SC	3	1	0	4
4		Software Quality Assurance	SC	2	1	1	4
5		Multi-Data Analysis	SC	2	1	1	4
6		Research Methodology & Documentation	SC	3	1	0	4
7	19526	Net Technology	SC	2	0	2	4
8		Fuzzy Theory	SC	3	1	0	4
9	19525	Image Processing	SC	3	0	1	4
10		Information Retrieval	SC	2	1	1	4
11	19516	Pattern Recognition	SC	3	0	1	4
12		Probability and Statistics	SC	3	1	0	4
13	19524	Artificial Intelligence	SC	3	1	0	4

14	19517	JAVA Programming	SC	2	0	2	4
15		Operations Research and Optimization	SC	3	1	0	4
16		Simulation and Modeling	SC	3	1	0	4
17	19505	Numerical Algorithms	SC	2	0	2	4
18		Mobile Communication	SC	3	1	0	4
		ELECTIVE					
1		Communication Skills and Professional Management	OE	3	1	0	4
2		Cryptography	OE	3	1	0	4
3		Data Analysis	OE	3	0	1	4
4		Data Compression	OE	3	0	1	4
5	19533	Data Mining	OE	3	1	0	4
6		Data Indexing	OE	2	1	1	4
7		Advanced Probability & Statistics	OE	3	1	0	4
8		Embedded Systems	OE	2	1	1	4
9	19503	Advanced Data Structures	OE	2	1	1	4
10		Hardware and Networking	OE	2	1	1	4
11	19517	Java Programming	OE	2	0	2	4
12		Matrix Programming	OE	1	1	2	4
13		Medical Imaging	OE	3	0	1	4
14	19506	Microprocessor	OE	3	0	1	4
15		Multimedia Communication	OE	3	1	0	4
16		Network Security	OE	2	1	1	4
17		Practicing Software Design	OE	1	1	2	4
18		Simulation and Modeling	OE	2	1	1	4
19		Software Engineering Case Tools	OE	1	1	2	4
20		Software Quality Testing	OE	2	1	1	4
21		Semantic Web	OE	2	1	1	4
22		System Analysis and Design	OE	3	1	0	4
23		Theory of Complexity	OE	3	1	0	4
24	19534	Process Automation	OE	2	1	1	4
25		Parallel Computing Algorithms	OE	2	1	1	4
26		Data Clustering	OE	2	1	1	4
27		Advanced Numerical Algorithms	OE	2	1	1	4
28		Fundamentals of Control Systems	OE	3	1	0	4
29		Computer Forensics	OE	2	1	1	4
30		Biometrics	OE	2	0	2	4
31		Web Programming	OE	1	1	2	4
32		Open Source Resources	OE	1	1	2	4
33		Business Intelligence	OE	2	0	2	4
34		Distributed Computing	OE	2	1	1	4

M. Sc. (2 YEARS) / M. Sc. Tech. (3 YEARS) IN COMPUTER SCIENCE

COURSE CODE & TITLE		CREDIT PATTERN (L: T: P)
	HARD CORE SUBJECTS	
MSCH1	Discrete Mathematics	3:1:0
MSCH2	Principles of Programming & Problem Solving	2:1:1
MSCH3	Data Structures	2:1:1
MSCH4	Computer Architecture	2:1:1
MSCH5	Algorithmics	2:0:2
MSCH6	System Software	2:1:1
MSCH7	Operating System	3:1:0
MSCH8	Theory of Languages	2:1:1
MSCH9	Data Base Management System	2:1:1
MSCH10	Computer Networks	2:1:1
MSCH11	Computer Graphics	2:1:1
MSCH12	Software Engineering	2:1:1
MSCH13	Object Oriented Analysis and Design	2:2:0
	SOFT CORE SUBJECTS	
MSCS1	Compiler Construction	2:1:1
MSCS2	Graph Theoretic Algorithms	2:1:1
MSCS3	Data Communications	3:1:0
MSCS4	Software Quality Assurance	2:1:1
MSCS5	Multi-Data Analysis	2:1:1
MSCS6	Research Methodology & Documentation	3:1:0
MSCS7	Net Technology	2:0:2
MSCS8	Fuzzy Theory	3:1:0
MSCS9	Image Processing	3:0:1
MSCS10	Information Retrieval	2:1:1
MSCS11	Pattern Recognition	3:0:1
MSCS12	Probability and Statistics	3:1:0
MSCS13	Artificial Intelligence	3:1:0
MSCS14	JAVA Programming	2:0:2
MSCS15	Operations Research and Optimization	3:1:0
MSCS16	Simulation and Modeling	3:1:0
MSCS17	Numerical Algorithms	2:0:2
MSCS18	Mobile Communication	3:1:0

ELECTIVE SUBJECTS

MSCE1	Communication Skills and Professional Management	3:1:0
MSCE2	Cryptography	3:1:0
MSCE3	Data Analysis	3:0:1
MSCE4	Data Compression	3:0:1
MSCE5	Data Mining	3:1:0
MSCE6	Data Indexing	2:1:1
MSCE7	Advanced Probability & Statistics	3:1:0
MSCE8	Embedded Systems	2:1:1
MSCE9	Advanced Data Structures	2:1:1
MSCE10	Hardware and Networking	2:1:1
MSCE11	Java Programming	2:0:2
MSCE12	Matrix Programming	1:1:2
MSCE13	Medical Imaging	3:0:1
MSCE14	Microprocessor	3:0:1
MSCE15	Multimedia Communication	3:1:0
MSCE16	Network Security	2:1:1
MSCE17	Practicing Software Design	1:1:2
MSCE18	Simulation and Modeling	2:1:1
MSCE19	Software Engineering Case Tools	1:1:2
MSCE20	Software Quality Testing	2:1:1
MSCE21	Semantic Web	2:1:1
MSCE22	System Analysis and Design	3:1:0
MSCE23	Theory of Complexity	3:1:0
MSCE24	Process Automation	2:1:1
MSCE25	Parallel Computing Algorithms	2:1:1
MSCE26	Data Clustering	2:1:1
MSCE27	Advanced Numerical Algorithms	2:1:1
MSCE28	Fundamentals of Control Systems	3:1:0
MSCE29	Computer Forensics	2:1:1
MSCE30	Biometrics	2:0:2
MSCE31	Web Programming	1:1:2
MSCE32	Open Source Resources	1:1:2
MSCE33	Business Intelligence	2:0:2
MSCE34	Distributed Computing	2:1:1

DETAILED SYLLABI FOR THE M. SC. TECH. COURSE IN COMPUTER SCIENCE & TECHNOLOGY COURSE

HARD CORE

COURSE-I : DISCRETE MATHEMATICS

COURSE OUTCOME

After completing this course, the student must demonstrate the knowledge and ability to understand the concepts of Mathematical logic, problem solving using set theory, find the applications of relation and recurrence relation, familiarize the concepts of functions and group codes to identify their applications.

COURSE CONTENT:

Mathematical logic, Set theory, Relation, Recurrence relation, Function, Groups and coding theory.

REFERENCES:

1. Discrete Mathematical Structures with applications to Computer Science by Tremblay & Manohar.
2. Discrete Mathematics by Kolman & Busby.

COURSE-II : PRINCIPLES OF PROGRAMMING LANGUAGES AND PROBLEM SOLVING

COURSE OUTCOME

Employ a problem-solving strategy to breakdown a problem into a series of simpler tasks. Execute problem-solving actions appropriate to completing a variety of sub problems. Apply analytical and logical thinking to extract facts from a problem description and determine how they relate to one another and to the problems to be solved. Develop problem-solving and programming skills using basic „C" constructs.

COURSE CONTENT:

Programming Languages, Role of Programming Languages in Problem Solving, Different Programming Paradigms, Imperative Programming-Design Principles, Control flow, pros and cons of imperative programming, Case Study using C, Object-oriented programming-General Characteristics, Design Principles - Objects, Classes, Messages, Methods, Data abstraction, Encapsulation, Polymorphism, Inheritance, Dynamic binding, Case Study using C++, Functional Programming - Mathematical Functions, Lambda functions, Higher Order Functions, Recursions. Introduction to LISP, Scheme, Haskell, Applications of Functional Languages, Comparison of Functional and Imperative Languages Logic Programming- Computing with Relations, Logic Programming with Prolog, Basic principles of Parallel Programming.

REFERENCES:

1. Seyed H. Roosta - Foundations of programming languages: design and implementation, Thomson/Brooks/Cole, 01-Aug-2002.
2. Ravi Sethi – Programming Languages: concepts and constructs, 2nd edition.
3. Robert W Sebesta – Concepts of Programming Languages, 4th edition.

COURSE-III : DATA STRUCTURES

COURSE OUTCOME

After the completion of this course, the student should be able to develop knowledge of basic data structures for storage and retrieval of ordered or unordered data. Data structures include: arrays, linked lists, binary trees. Develop knowledge of applications of data structures including the ability to implement algorithms for the creation, insertion, deletion, searching, and sorting of each data structure. Students learn to analyze and compare algorithms for efficiency using Big-O notation. Students implement projects requiring the implementation of the above data structures.

COURSE CONTENT:

Notion of Algorithm, Data, Data types and Abstract data types, Types of Data structures; Primitive, Non primitive, Linear- Nonlinear, Array, Stack, Queues, Graphs, Binary Trees, General Tree, Forest, Representation of data structures based on sequential storage and linked list storage – Associated functions and Axioms.

REFERENCES:

1. Jean-Paul Tremblay, P. G. Sorenson – An Introduction to Data Structures With Applications, McGraw-Hill.
2. Horowitz Ellis, Sahni Sartaj & Anderson-Freed Susan, Fundamentals of Data Structures In C(++), Orient Black Swan.
3. Debasis Samantha- Classic Data structures, PHI Learning Pvt. Ltd., 2nd edition.

COURSE-IV : COMPUTER ARCHITECTURE

COURSE OUTCOME

Describe fundamental units of computer system. Apply concept of fixed and floating point arithmetic. Identify different types of control unit. Analyze organization and design of memory system. Identify different ways of communicating with I/O devices and interfaces. Describe working of parallel systems.

COURSE CONTENT:

Introduction, addressing methods and machine program sequencing, assembly language, Stacks and Queues operations and applications subroutines, subroutine nesting, Logic instructions (AND, OR, NOT, XOR), Shift and Rotate instructions, Multiplication and Division operations, Register gating and timing of data transfers, Register Transfers, Performing arithmetic or logic operation, Execution of a complete instruction, Performance considerations, Hardwired control, Microprogrammed control, Input-Output organization, memory organization.

REFERENCES:

1. Computer Organization: V. Carl Hamacher, Zvonko G. Vranesic and Safwat G. Zaky, McGraw – Hill International Editions, Fourth Edition.
2. Fundamentals of Logic Design: C. H. Roth, 4th Edition.
3. Digital Design: Morris M. Mano, Prentice-Hall, Eaglewood Cliffs.
4. Digital Logic Design: J. P. Hayes, Addition-Wesley.

COURSE-V : ALGORITHMICS

COURSE OUTCOME

Formulate the problem, Analyze the asymptotic performance of algorithms, Decide and apply algorithmic strategies to solve given problem. Find optimal solution by applying various methods.

COURSE CONTENT:

Characteristic features of an algorithm, Aprirori and Aposteriori analysis, Deriving expressions for the worst case and best case computing time, exact and approximate expressions, profiling for average computing time, Case studies, Heaps, Hashing, **design Strategies** – Divide and Conquer, Greedy, Back tracking, Brach and Bound, Dynamic Programming, P, NP issues and Speed up issues through Parallel implementation.

REFERENCES:

1. Algorithms – E Horowitz, S Sahni, S Rajasekaran, UP.
2. Algorithms – T. H. Cormon, CE Leiserson, RL Rivert, PHI.

COURSE-VI : SYSTEMS SOFTWARE

COURSE OUTCOME

Basics of concepts of Assembler, Macroprocessor, Compilers, their importance and need for development. Design of Assembler, Macroprocessor, Loader and a simple compiler.

COURSE CONTENT:

Introduction - Components of a programming system, assembler, loaders, macros, linkers, compilers, operating systems, Formal Languages. **Assemblers** - Design of an assembler, **Macros –** Design of a Macro, **Loader and linkers –** Various loading schemes, **Compilers** - Introduction to compilers, Various Phases of a compiler, **Operating Systems** - Introduction to Operating System.

REFERENCES:

1. John J. Donovan – "System Programming", 12th Edition, TMH Publications, New Delhi, 1997.
2. Leland L. Beck - "System Software" 3rd edition, Addison Wesley, 1997.
3. Barron D. W. - "Assemblers and Loaders", Mc Donald and Javes, 1978.
4. Ullman J. D. – "Fundamentals of Programming Systems", Addison and Wesley, 1985.
5. D. M. Dhamdhere - "Systems Programming and Operating System", 2nd edition, JMH, 1999.

COURSE-VII : OPERATING SYSTEMS

COURSE OUTCOME

Analyze basics of operating system. Identify mechanism to handle processes, memory, I/O devices, and files and develop an appropriate algorithm for it. Possess knowledge of the role of Operating Systems and their types. Describe Memory management in operating System. Understand concept of management of process and their synchronization.. Apply the concept of a process, thread and scheduling algorithms. Realize the concept of deadlock and different ways to handle it. Realize various memory management techniques. Realize the concept of I/O management and File system. Identify and understand advanced operating systems, its advantages and features.

COURSE CONTENT:

Introduction – Definition, Necessity, various viewpoints of an OS, Features, Functions, Structure, Virtuality, **Process Management** – Concepts, Scheduling, Concurrent & cooperating processes, inter-process communication, Process Synchronization and Deadlocks, Threads, **Storage Management – Main Memory Management** – Various Strategies, Virtual Memory based methods, **File system interface** – file concept, access method, directory structure, file system structure and its implementation, **Mass storage structure** – Disk, structure, scheduling, management, **Protection and security** – Goals, domains, security problems, cryptography. **Case study – Linux operating system** - Design principles, Kernel Module, process management, scheduling, memory management, file system, input and output, inter-process communication.

REFERENCES:

1. Operating System Concepts by Abraham Silberschatz and Peter Baer Galvin and Greg Gagne, VIII Edition, John Wiley and sons, 2003.
2. Operating System Concepts and Design by Milan Milankovic, Second Edition, McGraw Hill 1992.
3. Operating System by Harvey M. Deitel, Addison Wesley,1990
4. Operating System – A Concept Based Approach, D.M. Dhamdhere, Tata McGraw Hill, 2002.

COURSE-VIII : THEORY OF LANGUAGES

COURSE OUTCOME

After the completion of this course, the student should be able to explain and manipulate the different concepts in automata theory and formal languages, explain the power and the limitations of regular languages and context-free languages. Also prove properties of languages, grammars and automata with rigorously formal mathematical methods and differentiate and manipulate formal descriptions of languages, automata and grammars with focus on regular and context-free languages, finite automata and regular expressions.

COURSE CONTENT:

Alphabets, languages, grammars, types of languages, regular languages: regular expressions, regular grammars, algorithmic properties of regular languages, various types of finite automata. Context-free languages: context-free grammars, derivation trees, ambiguous and unambiguous grammars, properties of context-free languages, push down automata, context sensitive grammars, Turing machines.

REFERENCES:

1. Introduction to Automata Theory, Languages, and Computation by John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson/Addison Wesley, 2007.
2. An Introduction to Formal Languages and Automata by Peter Linz, Jones & Bartlett Learning, 01-Jan-2001.

COURSE-IX : DATA BASE MANAGEMENT SYSTEM

COURSE OUTCOME

The course is intended to introduce the students to database systems. It provides an understanding of the fundamental concepts necessary for designing, using and implementing database systems and applications. Students will be able to learn basics of Data, Database management Systems, Characteristics of database systems, Advantages of Database base systems. Able to design Entity-Relational model for a problem and can solve queries using Relational Algebra. Practically, students able to create Oracle database and solve queries using standard query language.

COURSE CONTENT:

Introduction to Database Systems, Advantages, Data Models, Concept of Entities, Relationships, Database modeling using Entity-Relationship Diagram, Design of an E-R Database schema, Specialization and generalization. Relational Model, The Relational-Algebra, Introduction to SQL, its usage, Aggregation, Updates in SQLs, Views in SQL, Integrity Constraints, Domain Constraints, Referential Integrity, Functional Dependencies, Assertion and Triggers, Theory of Database design , Pitfalls in a relational database design, Desirable properties of a good database, Normal forms, Reduction of an E-R schema to Tables, Database Recovery, Database recovery techniques based on immediate and deferred updates, ARIES recovery algorithm, Shadow paging, Overview of Concurrency Control, Schedules, , Lock based protocols, Time stamp based protocols, Time stamp ordering Transaction Processing, Deadlock handling, File Organization, Indexing and Hashing, Buffer management.

REFERENCES:

1. Database System Concepts by S. Sudarshan, Abraham Silberschatz, Henry F. Korth
2. Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke.
3. Database Systems: The Complete Book by: Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Wisdom.

COURSE-X : COMPUTER NETWORKS

COURSE OUTCOME

After completing this course, the student must demonstrate the knowledge and ability to independently understand basic computer network technology. Understand and explain Data Communications System and its components, Identify the different types of network topologies and protocols. Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer. Identify the different types of network devices and their functions within a network Understand and building the skills of sub netting and routing mechanisms. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

COURSE CONTENT:

A Communication Model, Data Communication, WAN, LAN, Protocols, TCP/IP Protocol Architecture, OSI Model, Standards, Characteristics, Functions, transmission Media, Optical fiber, Wireless transmission; LANs and Medium Access Control Protocols - Multiple Access Communications, LAN Standards, Network Layer & Networking Devices.

COURSE-XI : COMPUTER GRAPHICS

COURSE OUTCOME

After completing this course, the student must demonstrate the knowledge and ability to describe the input output devices used in a graphics system scan convert any other basic primitive and develop the related algorithm. Apply 2D transformation on any given object. Perform window to viewport transformation of the given object and to implement the same. Familiarize the line clipping and polygon clipping algorithms. Understand the various representations of a 3D object Project an object in 3D onto the display device identify the hidden surfaces and eliminate them.

COURSE CONTENT:
Input/output devices, output primitives, region filling, 2D transformation, Viewing transformation, Clipping, 3D representation and transformation, Projection, Hidden surface elimination.

REFERENCES:
Computer Graphics by Hearn & Baker.

COURSE-XII : SOFTWARE ENGINEERING

COURSE OUTCOME
Decide on a process model for a developing a software project. Classify software applications and Identify unique features of various domains. Design test cases of a software system. Understand basics of IT Project management. Plan, schedule and execute a project considering the risk management. Apply quality attributes in software development life cycle.

COURSE CONTENT:
Introduction, software life cycle models, requirements analysis and specification, software design, function-oriented design, object-oriented design using UML, user interface design, coding and testing, software reliability and quality management, software maintenance, computer aided software engineering, software project management.

REFERENCES:
1. Roger S. Pressman – Software Engineering, Sixth Edition, Mc Graw Hill.
2. Ian Sommerville – Software Engineering, Fifth Edition, Addison-Wesley.
3. Rajib Mall – Fundamentals of Software Engineering, PHI.
4. Pankaj Jalote – An Integrated Approach to Software Engineering, Third Edition.

COURSE-XIII : OBJECT ORIENTED ANALYSIS AND DESIGN

COURSE OUTCOME
At the end of the course, the students will be able to understand the fundamental concepts of Object-Oriented Programming, familiar with problems of complex systems, evolution of object-oriented model, classes, object-oriented methodology and it notations, specify, analyze and design the use case driven requirements for a particular system, know the benefits and the risks of using UML and learn how to map one style of diagrammatic notations into another.

COURSE CONTENT:
Complexity - Structure of complex system, Inherent Complexity of software, Attributes of complex system, categories of analysis and design methods, Designing complex system, **The Object Model** – The evolution of object model, Elements of object model, applying the object model, Foundations of the object model, **Classes and Objects** – The nature of an object, Relationship among objects, the nature of a class, Relationship among classes, The interplay of classes and objects, On building Quality classes and objects, invoking a method, **Classification** – The importance of proper classification, Identifying classes and objects, Key abstraction and mechanisms, **Notation** – UML, Basic Behavioral Modeling, Basic elements, Diagram - Package, Component, Deployment, Use Case, Activity, Class , sequence, Interaction overview, Composite structure, State machine, Timing, Object, Communication, **Process** – Principles, macro process – SDLC, Micro process – Analysis and design process, **Pragmatics**- Management and planning, staffing, Release management, Reuse, Quality

Assurance Metrics, Documentation, Tools, The benefits and risks and Object-oriented development, **A few Case studies.**

REFERENCES:

1. Object Oriented Analysis and Design with Application by Grady Booch et al, 3nd Edition, Pearson Education.
2. Object-Oriented Modeling and Design with UML by Michael R. Blaha, James R. Rumbaugh, 2nd Edition, Pearson Education.
3. UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design by Jim Arlow, 2nd Edition, Pearson Education.
4. Object Oriented Systems Development by Ali Bahrami, First Edition, Irwin-McGraw Hill New Delhi, International Edition.

SOFT CORES

COURSE-I : COMPILER CONSTRUCTION

COURSE OUTCOME

To solve problem of parsing and compiling. Ability to design and write simple compiler. To be able to use compiler tools in basic, concurrent, distributed and embedded environments. To develop awareness of latest trends and advances in compilers

COURSE CONTENT:

Language processing system, analysis of source program, the phases of a complier, lexical analyzer, syntax analyzer, Bottom up Parsing, Top down parsing, LR parsers, Syntax Directed translation scheme, Intermediate code generation and 3-adres code representation, code generation and optimization.

REFERENCES:

1. Alfred W Aho, Ravi Sethi, Jeffrey D Ullman, compilers- principles, techniques and tools, addition- Wesley.
2. Andrew W Apple, modern complier implementation in c, Cambridge university press, 1997.
3. Kenneth C Louden, Complier construction principles, Thomson Education, 1997.

COURSE-II : GRAPH THEORETIC ALGORITHMS

COURSE OUTCOME

Solve real world problems logically using appropriate set theory concepts. Analyze concepts of number theory. Analyze concepts of relation. Understand concepts of groups and rings. Analyze data structure used to represent different kinds of objects viz Graph, Trees. Understand the basics of combinatorial structure and develop algebraic technique to solve combinatorial problems.

COURSE CONTENT:

Graph- Simple and General Graphs, Undirected and Directed Graphs, Graph data Structures- Incidence matrix and Adjacency matrix- Algorithmic formulation, Paths, Walks, Traversals, Eulerian and Hamiltonian traversals, Shortest distances, Greedy, Dynamic, Depth First – Backtracking, Breadth First, Branch and Bound Strategies for algorithmic implementation, Trees, Cusets, Planarity, Duality, Chromaticity, Applications, Algorithmic implementation.

REFERENCES:

1. Graph Theory – N Deo.
2. Graph Theory - Douglas B West.
3. Chapters from the books on Algorithms.

COURSE-III : DATA COMMUNICATION

COURSE OUTCOME

At the end of the course, the students will be able to students are able to recognize and describe about the working of Computer Networks. Illustrate reference models with layers, protocols and interfaces. Summarize functionalities of different Layers. Combine and distinguish functionalities of different Layers. Model the LAN and WAN configuration using different media. Examine problems of a computer networks. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks. Understand and building the skills of subnetting and routing mechanisms. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

COURSE CONTENT:

Data Communications, A communication Model, Data Representation, Networks, Protocols and Standards, TCP/IP Protocol Suite, OSI Model, Signals, Data rate limits, Impairments, Digital transmission, Modes of transmission, Analog transmission, Telephone modems, Multiplexing, Transmission media, Circuit Switching, Error Detection and Correction, Data Link Control and Protocols, HDLC, Multiple Access, Connecting Devices, Virtual Circuit Switching, Frame Relay, ATM, Addressing, Routing, Network Layer Design Issues, Implementation of Connectionless and Connection Oriented Service, Routing Algorithms, Shortest Path Routing, General Principles of Congestion Control, Congestion Prevention Policies, Transport Service Primitives, Berkeley Sockets, Elements of Transport Protocols.

REFERENCES:

1. Behrouz A Forouzan, Data Communications and Networking, Tata McGraw Hill-2001, 2nd edition.
2. William Stallings, Data and Computer Communication, 6th Edition, Pearson Education, 2001.
3. Alberto Leon – Gracia and Indra Widjaja, Communication Networks – Fundamental Concepts and Key architectures, Tata McGraw Hill, 2000.
4. Achyut S Godbole, Data Communications and Networks Tata McGraw Hill, 2002.

COURSE-IV : SOFTWARE QUALITY ASSURANCE

COURSE OUTCOME

At the end of the course the students will be able to utilize the concepts in software development life cycle, demonstrate their capability to adopt quality standards. Assess the quality of software product and apply the concepts in preparing the quality plan & documents.

COURSE CONTENT:

The software quality challenge, Software quality, Software quality factors, The components of software quality assurance system, Integrating quality activities in the project life cycle, Software testing, Assuring the quality of software maintenance components, Case tools and their effect on software quality, Procedures, work instructions and quality devices, Staff training and certification, Software configuration management, Documentation control, Software quality metrics, Quality

management standards, Management and its role in software quality assurance, The SQA unit and other actors in the SQA syatem.

REFERENCES:

1. Daniel Galin, Software Quality Assurance: From Theory to Implementation, Addison Wesley, 2003.
2. Stephen Kan, Metrics and Models in Software Quality Engineering (2nd Edition), Addison Wesley, 2002.
3. Watts S. Humphrey, Managing the software process, Addison-Wesley.

COURSE-V : MULTI-DIMENSIONAL DATA ANALYSIS (DATA ANALYSIS)

COURSE OUTCOME

The students will be able to explore the fundamental concepts of multi data analysis and also understand data analysis techniques for applications handling large data.

COURSE CONTENT:

Data – Temporal data, Spatial data, Multispectral data, Multi Sensor/ Source data, Features, Samples, Multidimensional Representation, Proximity matrix, Distance Computation, Analysis with missing feature values, Learning in Multidimensional data space, Data Representation, Cluster Analysis, Case studies from Pattern Recognition, Image Processing, Data Mining and other applications.

REFERENCES: Appropriate Literature.

COURSE-VI : RESEARCH METHODOLOGY & DOCUMENTATION

COURSE OUTCOME

After completing this course, the student must demonstrate the knowledge and ability to independently understand on various kinds of research, objectives of doing research, research process, research designs and sampling, have basic knowledge on qualitative research techniques Understand and explain its stages and also can write plagiarism free reports of their invention

COURSE CONTENT:

Advanced Algorithms: Complexity Issues, P vs NP, Nondeterministic Problem Reduction, Approximation Algorithms, Data: Types of Data, Clustering, Normalization, Strategies of Clustering, Reduction of Dimension, Graph Slicing, Research: Overview, Hypothesis, Research Categories, Research Process, Documentation, Paper Publications, Thesis Writing, Research Discussions (Seminars, Conferences, Symposiums, Workshops).

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran-Computer Algorithms, Silicon Press, 2008.
2. Jean-Paul Tremblay, P. G. Sorenson – An introduction to data structures with applications, McGraw-Hill.
3. Horowitz Ellis Sahni Sartaj & Anderson-Freed Susan Fundamentals of Data Structures In C (Pul), Orient Black Swan.
4. Anil K Jain, R. C. Dubes: Algorithms for Clustering Data.
5. Anil K Jain, M. N. Murthy and P. J. Flynn: Data Clustering-A Review.
6. Related Research papers.

COURSE-VII : NET TECHNOLOGY

COURSE OUTCOME

Students will be able to understand the development of C# programs and will be to utilize the .NET framework to build Asp.net web applications. They will be able to understand the 3-tier software architecture (presentation/client tier, application tier, data tier) and develop multi-tier applications and also practice the development of web applications using a combination of client-side (JavaScript, HTML) and server-side technologies (ASP.NET, ADO.NET).

COURSE CONTENT:

Introduction: An overview of the .NET framework. CLR, FCL, ASP.NET to support Internet development and ADO.NET to support database applications, Introduction to C#: Program structure, Writing methods, Recursion and overloading arrays and data presentation Class definitions. Properties, indexers, and access Arrays control, Inheritance and polymorphism, delegates, Exception handling.

AOD.NET: Introduction to SQL, ADO.NET after Native Drivers, ODBC Drivers, DAO/RDO and ADO. Database using VS.NET Establishing Connection with Database, **ASP.NET**: Web forms in ASP.NET, States, Validation, Login; ASP.NET Administrative tasks ASP.NET Data controls, Ajax Extensions, LINQ, Working with XML data, Web Services.

REFERENCES:

1. Pro C# with .NET 3.0 by Andrew Troelsen.
2. Microsoft ASP.NET by G. Andrew Duthie.
3. Building ASP.NET WebPages with Microsoft web Matrix. By Steve Lydford.

COURSE-VIII : FUZZY THEORY

COURSE OUTCOME

The student will be able to interpret fuzzy set theory and uncertainty concepts, identify the similarities and differences between probability theory and fuzzy set theory and their application conditions, apply fuzzy set theory in modeling and analyzing uncertainty in a decision problem iv. apply fuzzy control by examining simple control problem examples

COURSE CONTENT:

Introduction, classical sets and fuzzy sets, classical relations and fuzzy relations, Properties of Membership Functions, Fuzzification, and Defuzzification, Development of Membership Functions, Fuzzy Classification and Pattern Recognition, fuzzy arithmetic, fuzzy system design.

REFERENCES:

1. Fuzzy Logic with Engineering Applications: Timothy J Ross, Second Edition, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, England.
2. Fuzzy Sets and Fuzzy Logic-Theory and Applications: George J. Klir and Bo Yuan, Prentice Hall, New Jersy.

COURSE-IX : IMAGE PROCESSING

COURSE OUTCOME

Develop and implement algorithms for digital image processing. Apply image processing algorithms for practical object recognition applications.

COURSE CONTENT:
Introduction to digital image processing, Stages, Application areas, components, electromagnetic spectrum, image sensing and acquisition, image sampling and quantization, relationships between pixels, Enhancement in spatial domain: Intensity transformation functions.

Spatial filtering, Frequency domain enhancement: Discrete Fourier transform (DFT) properties of the 2D discrete Fourier transform, filtering in the frequency domain, Introduction to Color image processing.

Segmentation – Intensity based – point, line and edge. Region based – Boundaries, egion growing, Thresholding, splitting and merging, segmentation by morphological watersheds, the use of motion in segmentation.

Morphological operations: Preliminaries, opening and closing, the hit-or-miss transformation, some basic morphological algorithms, gray-scale images. Image representation
Some applications: Document image processing, Biometrics, robot vision, medical applications.

REFERENCE BOOKS:

1. R. C. Gonzalez, R. E. Woods, Digital Image Processing, 3-rd ed. Prentice Hall, Pearson publication.
2. Anil K Jain, Digitial Image Processing, PHI Publication
3. Milan Sonka, Image Processing, Analysis, and Machine Vision, 3rd Edition, CL Engineering(2013)

COURSE-X : INFORMATION RETRIEVAL

COURSE OUTCOME

Understand the concept of information retrieval; deal with storage and retrieval process of text and multimedia data. Able to evaluate the performance of any information retrieval system. Understand concept of multimedia and distributed information retrieval.

COURSE CONTENT:
Information retrieval using the Boolean model. The dictionary and postings lists. Tolerant retrieval. Index construction and compression. Vector space model and term weighting. Evaluation in information retrieval. Relevance feedback and query expansion. Probabilistic information retrieval. Language models for information retrieval. Text classification and clustering. Latent semantic indexing. Web search basics. Web crawling and indexes. Link analysis.

REFERENCES:

1. C. D. Manning, P. Raghavan, and H. Schutze, Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Recent Literature.

COURSE-XI : PATTERN RECOGNITION

COURSE OUTCOME

After completing this course, the student must demonstrate the knowledge and ability to independently understand basic pattern recognition system. Understand and explain pattern recognition system and its stages. Understand classifiers and utilize to develop pattern

recognition systems. Understand clusters and utilize to develop pattern recognition systems. Understand and building the skills in developing different applications.

COURSE CONTENT:

Introduction: Machine perception, pattern recognition system, design cycle, learning and adaptation Bayesian Decision Theory- Introduction, Bayesian decision theory – Continuous features, classifiers, discriminant functions and decision surfaces, normal density, Base decision theory – Discrete features. missing and noisy features.

Maximum likelihood and Bayesian parameter estimation: Introduction, Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation. Non-parametric techniques: Introduction, probabilistic neural networks, K nearest neighbor estimation, the nearest neighbor rule, metrics and nearest neighbor classification, fuzzy classification.

Linear discriminant functions: Introduction, Linear discriminant functions, generalized Linear discriminant functions: Introduction, Linear discriminant functions, generalized linear discriminant functions, minimizing the perceptron criterion function, Support Vector Machines.

Unsupervised learning and clustering: Mixture densities and identifiability, Maximum likelihood estimates, application to normal mixtures, unsupervised Bayesian learning, data description and clustering, criterion functions for clustering, hierarchical and divisive clustering, partitional clustering, component analysis.

REFERENCES:

1. Richard O Duda, Peter E Hart and David G Stork- Pattern classification. John Wiley and sons.inc 2nd ED 2001
2. Christopher M Bishop- Pattern Recognition and Machine Learning, 2006, Springer.
3. Earl Gose, Richard Johnsonbaugh, Steve Jost- Pattern recognition and image analysis, Prentice Hall PTR

COURSE-XII : PROBABILITY AND DISTRIBUTION THEORY

COURSE OUTCOME

After completing this course, the student must demonstrate the knowledge and ability to describe the basic concepts of probability, discrete probability distributions – Binomial, Poisson, Geometric, Hyper-geometric, Uniform and their related applications, Continuous probability distributions – Exponential, Normal, Uniform and their related applications. Understand the basics of Sampling distributions and their applications. Familiarize with point and interval estimation, hypothesis testing and regression analysis.

COURSE CONTENT:

Basic Concepts, Discrete Probability Distribution, Continuous Probability Distribution, Joint Probability Distributions, functions of random variables, Sampling and estimation, Hypothesis Testing, Correlation and Regression

REFERENCES:

1. Probability and Statistics with applications to Computer Science by K. S. Trivedi.
2. Probability and Statistics for Engineers by G.S.S. Bhishma Rao

COURSE-XIII : ARTIFICIAL INTELLIGENCE

COURSE OUTCOME

Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.

Explain how Artificial Intelligence enables capabilities that are beyond conventional technology, for example, chess-playing computers, self-driving cars, robotic vacuum cleaners.

Use classical Artificial Intelligence techniques, such as search algorithms, minimax algorithm, neural networks, tracking, robot localization.

Ability to apply Artificial Intelligence techniques for problem solving.
Explain the limitations of current Artificial Intelligence techniques.

COURSE CONTENT:

Introduction; State space search - Blind searches, Heuristic searches, Search in game tree; Predicate logic - Backward reasoning, Resolution; Other reasoning methods - Probabilistic, Fuzzy, Non monotonic; Knowledge representation - Overview of Semantic nets, Frames, Conceptual dependency, Scripts; Planning - Goal stack, Non linear, Hierarchical; Expert systems; Learning - Rote, By Advice, By Analogy, Macro.

REFERENCES:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar Nair, Tata McGraw Hill.
2. Artificial Intelligence, Patrick Henry Winston, AWL.
3. Artificial Intelligence and Expert Systems, Dan W. Patterson, PHI.
4. Artificial Intelligence, Nils J Nilson, Elsevier, Morgan Kaufmann.
5. Introduction to Artificial Intelligence, Eugene Charnaik, Drew McDermott, AWL.

COURSE-XIV : JAVA PROGRAMMING

COURSE OUTCOME

Understand how to write, compile, and execute Java programs that may include basic data types and control flow constructs using J2SE or other Integrated Development Environments (IDEs) such as Eclipse, NetBeans, and JDeveloper.

Learn how to Write, compile and execute Java programs using object oriented class structures with parameters, constructors, and utility and calculations methods, including inheritance, test classes and exception handling.

Learn how to write, compile, and execute Java programs using arrays and recursion, manipulating Strings and text documents, GUIs and event driven programming.

Learn how to write a final project that may be selected from among the following: applets for inclusion in web pages; applets to access enterprise data bases in robust, enterprise three level applications; secure communications over the internet; or an approved project chosen by the student.

COURSE CONTENT:

Introduction - Java features, basic java programming constructs, classes and objects – Creating objects, Methods overloading, Constructors, Abstract classes, Arrays, vectors, string and wrapper classes, **Inheritance and packages**– Types of inheritance, Methods overriding, , Interface – Creating and extending interface, Packages, – API packages, creating user defined package, access protection, enum type, **Applets, thread and exception handling** – Creating and executing applets, Applet life

cycle, Applet methods, parameterized applets, Graphics applications , Multithreading, thread methods and states, thread priority, Synchronization, Exception handling – try and catch block, multiple try and catch blocks, user define exception, Input output stream classes **Networking and database application** – Network programming – Client server, TCP/IP, socket programming, multithreaded sockets, GUI in java – AWT, container class, layouts, Swings and Database application using java, Java Servlets, Creating RMI applications

REFERENCE:

1. K. Arnold and J. Gosling, "The JAVA programming language", Fourth edition, Addison Wesley Publishing Company (2005).
2. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.
3. Herbert Schildt, Java: The Complete Reference, 8th Edition, Tata McGraw-Hill Publishing Company Ltd., 2006.
4. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education, 2008.

COURSE-XV : OPERATIONS RESEARCH AND OPTIMIZATION TECHNIQUES

COURSE OUTCOME

Identify and develop operational research models from the verbal description of the real system. Understand the mathematical tools that are needed to solve optimization problems. Use mathematical software to solve the proposed models.

COURSE CONTENT:

Linear programming- LPP models, Graphical solution, Simplex solution, Big M method, Two phase method, Dual, Primal dual relation, Dual simplex method, Revised simplex method, Sensitivity, Transportation and Assignment models; Network models- Spanning tree, Shortest routes and distances, Maximal flow, Minimum cost flow, CPM, PERT; Decision making- Deterministic and probabilistic methods; Game theory- Zero sum games.

REFERENCES:

1. Operations Research-An Introduction, Hamdy A Taha, PHI.
2. Operations Research, R Panneer Selvam, EEE.
3. Operations Research, P Shankar Iyer, Sigma Series.

COURSE-XVI : SIMULATION AND MODELING

COURSE OUTCOME

Understand the fundamental elements of discrete-event simulation including statistical models, random processes, random variates, and inputs to simulation.

Analyze a real world problem and apply modeling methodologies to develop a discrete-event simulation model.

Recognize the cost/benefits of computer simulation, the generation of meaningful results, decision making, and risks

Interpret and contrast discrete-event techniques for implementing a solution to a simulation problem.

Compare and evaluate alternative system designs using sampling and regression.

COURSE CONTENT:
Introduction – Simulation as a tool, Good and bad about simulation, Applications, System Environment and components, Types of Models, Steps in Simulation Study; Simulation Examples – Hand simulation of continuous and discrete systems, lag models; Probability distributions; Pseudo random numbers – Generation, tests, various distributions, problems, tests; Frequency, independence, runs, gap; Special purpose simulation language – Problem solving; Analysis, Validation of models, verification, run length determination, variance reduction.

REFERENCES:

1. Discrete System Simulation, Jerry Banks, John S Carson II, Barry L Nelson, David M Nicol, Pearson Education Asia.
2. System Simulation, Geoffrey Gordon, Prentice Hall India.
3. System Simulation with Digital Computers, N. Deo, PHI.

COURSE-XVII : NUMERICAL ALGORITHMS

COURSE OUTCOME
The students will be able to understand the importance of numerical methods which is generally used to solve problems on Computers rather than solving mathematically. They will enhance the usage of these methods from algorithmic point of view and also the applications of these methods in solving worldly physical, scientific and research oriented problems.

COURSE CONTENT:
Computers and Error analysis, Algorithm to computing roots of equations , Algorithms to solve system of linear algebraic equations, Regression and Interpolation, Integration and Differential Equations - Numerical Integration- Trapezoidal rule, Simpson"s rule, Ordinary differential equations, Partial differential.

REFERENCES:

1. V. Rajaraman, "Computer oriented numerical methods", 2nd Edition, Prentice Hall of India, 1992.
2. R K Jain, P.K Iyengar "Numerical methods for scientist and engineers".
3. Numerical methods by S. S. Sastry.
4. Numerical methods by E. Balaguruswamy.
5. Numerical methods by V. N. Vedamurthy and N.C.S.N. Iyengar.
6. S C Chapra and R P Canale, Numerical methods for engineers McGraw international edition, 1990.

COURSE-XVIII : MOBILE COMMUNICATION

COURSE OUTCOME

Explain and apply the concepts telecommunication switching, traffic and networks. Analyze the telecommunication traffic. Analyze radio channel and cellular capacity. Explain and apply concepts of GSM and CDMA system. Students will gain knowledge of GSM architecture, mobility management, working of wireless architectures and their applications and recent trends and emerging technologies.

COURSE CONTENT:
History of wireless communication, Some open research topics, simplified reference model, Signals, Antennas , Signal propagation, Multiplexing, modulation, spread spectrum, cellular system .Medium access control .MAC,SDMA,FDMA,TDMA,CDMA, GSM, DECT, TETRA,UMITS and IMT-

2000,Satellite systems, Routing , Localization ,handover, Broadcast Systems, Cyclical repetition of data, Digital audio broadcasting, digital video broadcasting, convergence of broadcasting and mobile communication, Wireless LAN, Infra-red v/s radio transmission, Ad-hoc networking, IEEE 802.11, Hyper LAN, Bluetooth, Mobile Network layer, Mobile IP, Dynamic host configuration protocol, Mobile ad-hoc networks

REFERENCES:

1. Mobile Communication- John Schiller, second edition.
2. S Stallings, W. "Wireless Communications and Networks".
3. Roy Blake, "Wireless Communication Technology", Cengage Learning, India Edition.
4. Mark Ciaampa, Jorge Olenewa, "Wireless Communications", Cwenage learning.
5. Principles of Mobile Computing Uwe Hansmann, et. Al, Springer International Ed.

ELECTIVE SUBJECTS

COURSE-I : COMMUNICATION SKILLS AND PROFESSIONAL MANAGEMENT

COURSE OUTCOME

At the end of the course the student shall be able to develop an understanding regarding effective communication and required skills. Development of the four broad essential communication skills in i.e. – Reading, Writing, Listening and Speaking. Enhancement of vocabulary and English proficiency of the students.

COURSE CONTENT:

Importance of communication, its basic model, formal and informal communications, barriers to communication, feedback and its effectiveness, conflict communication, Oral communication – influencing factors, self confidence, role of trust, motivational factors, style, importance of listening, role of visual arts, informative and persuasive communication, Written communication – writing style, important of writing skills, book review and disadvantages over oral communication, Letter writing – formal and informal letters, official and demi-official letters, business and commercial letters, personal correspondence. Technical report writing and effective meeting, Support by word processing systems, LOTUS, Graphics software for Professional Management.

REFERENCES:

1. Effective Communication made simple – Rupa & Co.
2. Communication for results – C Hamilton & Parker.
3. Instrument of Communication – P Meredith.
4. Basic Management skills for all – E H McGrath.
5. Managerial Communication – P M Timm.
6. Thesis and Assignment writing – Anderson.

COURSE-II : CRYPTOGRAPHY

COURSE OUTCOME

Analyze the vulnerabilities in any computing system and hence be able to design a security solution.

Identify the security issues in the network and resolve it.

Evaluate security mechanisms using rigorous approaches, including theoretical.

Compare and Contrast different IEEE standards and electronic mail security.

COURSE CONTENT:

Introduction- Security concepts, Attacks, Services, Mechanisms, Model for security, Need for security, Trends in security; Symmetric ciphers - Classical substitution techniques, Transposition techniques, Rotor machines, Steganography; Block ciphers- Principles; Feistel design; DES; Multiple encryption and triple DES; Asymmetric ciphers- Background mathematics, RSA, Diffie Hellman key exchange, Hash function, MAC, Digital signature; Mutual trust- Key management and distribution, User authentication; Internet security- E mail security, IP security; System security- Intruders, Virus, Worms, Firewalls.

REFERENCES:

1. Cryptography and Network Security, William Stallings, Pearson.
2. Cryptography and Network Security, Atul kahate, Tata McGraw Hill.
3. Cryptography, Forouzan.

COURSE-III : DATA ANALYSIS

COURSE OUTCOME

Understand the importance of data analysis and different types of data need to be analyzed in scientific and business applications.

Learn how to extract knowledge from data which drives business decisions.

Understand how organizations and enterprises analyze data from a multitude of sources using Big Data management solutions and customer experience management solutions that utilize data analysis to transform data into actionable insights.

Course Content: NOT RECEIVED THE CONTENTS

COURSE-IV : DATA COMPRESSION

COURSE OUTCOME

Students will be able to understand important of data compression, develop a reasonably sophisticated data compression application, select methods and techniques appropriate for the task and also develop the methods and tools for the given task,

COURSE CONTENT:

Introduction to the need of compression and various compression techniques-Lossless and Lossy Compression, Huffman Coding, Arithmetic Coding, Dictionary Techniques, Lossless Image Compression, Scalar Quantization, Vector Quantization, Differential Encoding, Transform Coding, Sub-band Coding, Wavelet-Based Compression, Audio Coding, Introduction to Video Compression.

REFERENCES:

1. Data Compression – David Salomon, Springer Publication, 4th Edition.
2. Introduction to Data Compression – Khalid Sayood, Morgan Kaufmann Series, 3rd Edition.

COURSE-V : DATA MINING

COURSE OUTCOME

To develop programs and methods for data Mining applications. To solve problems for multi-core or distributed, concurrent / Parallel environments.

COURSE CONTENT:

Introduction: Basic Data Mining Tasks, Data Mining Issues, Data Mining Metrics, Data Mining from a Database Perspective, Data Mining Techniques: A Statistical Perspective on Data Mining, Similarity Measures, Decision Trees, Neural Networks, Genetic Algorithms, Classification: Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms, Neural Network-Based Algorithms, Rule-Based Algorithms, Combining Techniques, Clustering: Similarity and Distance Measures, Hierarchical Algorithms, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Association Rules: Basic Algorithms, Parallel and Distributed Algorithms, Incremental Rules, Advanced Association Rule Techniques, Measuring the Quality of Rules, Advanced Techniques: Web Mining, Spatial Mining, Temporal Mining.

REFERENCES:

1. Han and Kamber, Data Mining: Concepts and Techniques, 2nd Ed., Morgan Kaufman, 2006.
2. Dunham, Data Mining: Introductory and Advanced Topics, Pearson, Education, 2001.
3. Witten and Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 2000.
4. Hand, Mannila and Smyth. Principles of Data Mining. Prentice-Hall. 2001.

COURSE-VI : DATA INDEXING

COURSE OUTCOME

On completion of this course, the students will be able to understand and analyse the Information Systems as socio-technical systems, its need and advantages as compared to traditional file based systems, understand the architecture of DBMS, conceptual data modeling, logical database design and physical database design, understand and analyze Database design using E-R data model by identifying entities, attributes, relationships, generalization and specialization along with relational algebra, apply and create Relational Database Design process with Normalization and Denormalization of data, Learn database Implementation with SQL, Usage of DDL aspect of SQL, DML aspect of SQL, aggregate functions, group by clause, sub query, joins, co-related sub query and indexes.

COURSE CONTENT:

Introduction to the notion and importance of data indexing. Different indexing structures: Binary tree as search tree, Concept of balanced trees, KD-trees, B+ trees, R-trees, G-trees and associated insertion and deletion algorithms,. Hashing: Static Hashing, Collision and its resolution, perfect and near perfect hashing, Dynamic hashing: combination of hashing and tree structures. Functions and axioms associated.

REFERENCES: Associated literature papers.

COURSE-VII : ADVANCED PROBABILITY AND STATISTICS

COURSE OUTCOME

Learn basic probability axioms and rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables.

Learn how to derive the probability density function of transformations of random variables and use these techniques to generate data from various distributions, how to calculate probabilities, and derive the marginal and conditional distributions of bivariate random variables.

Learn how to use discrete time Markov chains and methods of finding the equilibrium probability distributions, how to calculate probabilities of absorption and expected hitting times for discrete time Markov chains with absorbing states and how to translate real-world problems into probability models.

COURSE CONTENT:

Random variable, discrete distribution, Continuous distribution, Joint and Conditional distribution, Sampling distributions and applications, Distributions of functions of random variables, Estimation and inference, Multivariate distribution, Compound distribution.

REFERENCES:

1. Probability and Statistics with applications to Computer Science by K. S. Trivedi.

COURSE-VIII : EMBEDDED SYSTEMS

COURSE OUTCOME

Get insight of design metrics of Embedded systems to design real time applications to match recent trends in technology. Understand Real time systems concepts. Understand Linux operating system and device drivers. Get to know the hardware – software co design issues and testing methodology for embedded system.

COURSE CONTENT:

Introduction to Embedded Systems, Classification, Major Application Areas, Characteristics and Quality Attributes of Embedded Systems, Typical Embedded Systems, ASICs, PLDs, , Memory: ROM, RAM, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces, Embedded Firmwares, Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages, RTOS Based Embedded System Design, Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling. Task Communication, Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization, Device Drivers.

REFERENCES:

1. Introduction to Embedded Systems - Shibu K.V, Tata McGraw Hill.
2. Embedded Systems - Raj Kamal, TMH.

COURSE-IX : ADVANCED DATA STRUCTURES

COURSE OUTCOME

Formulate and apply object oriented programming, using C++, as a modern tool to solve engineering problems.

Demonstrate an understanding of basic data structures (such as an array based list, linked list, stack, queue, binary search tree) and algorithms.

Demonstrate the ability to analyze, design, apply and use data structures and algorithms to solve engineering problems and evaluate their solutions.

Demonstrate an understanding of analysis of algorithms. Study an algorithm or program code segment that contains iterative constructs and analyze the asymptotic time complexity of the algorithm or code segment.

COURSE CONTENT:

Review of fundamental data structures, Spatial data representation-2D strings and its variants, 9DLT, TSR, Indexing- B-trees and its variants, R-trees and its variants, G-trees, K-D trees, quad trees, Hashing algorithms, associated algorithm along with the study on their time/space complexity, applications.

REFERENCES:

1. Symbolic projection for image information retrieval and spatial reasoning by S. K. Change and E. Jungert.
2. Jean-Paul Tremblay, P. G. Sorenson – An introduction to data structures with applications, McGraw-Hill, 1984 – Computers.
3. Related research papers.

COURSE-X : HARDWARE AND NETWORKING

COURSE OUTCOME

The students will be able to gain skills in the areas Hardware and Networking and provide IT infrastructure solutions, such as PC Hardware Maintenance, Customer Support, Networking Support, and Data centre support to provide round the clock service to the customers.

COURSE CONTENT:

Hardware: Basic Computer System & Peripherals, Mother Board, Serial Device, Storage Devices, Parallel Devices, Types of software"s, Boot process, Types of PC"S,PC Tool"s, Power Supply, **OPERATING SYSTEM** - Introduction, File System, CPU & Disk, Memory Management, Features of Windows, Linux, **Networking:-** Basic Data Communication, Data Transmission, Transmission Media, Protocols & Architecture Data Link, Local Area Network, Networking Devices, Network Layer, Transport Protocols, Wide Area Network, Basic Video Conferencing

REFERENCES:

1. Hardware and Networking Course Kit by Vikas Guptha.
2. Computer Networks by C. R. Sarma.

COURSE-XII : MATRIX PROGRAMMING

COURSE OUTCOME

COURSE CONTENT:

Introduction to the basic features of Matlab including data structures, control structures and functions. Development environment for managing code, files, and data. Interactive tools for iterative exploration, design, and problem solving, Mathematical functions for linear algebra, statistics, Fourier analysis, filtering, optimization, and numerical integration, 2-D and 3-D graphics functions for visualizing data. Tools for building custom graphical user interfaces, Functions for integrating MATLAB based algorithms with external applications and languages, such as C, C++, FORTRAN, Java, COM, and Microsoft® Ex.

REFERENCES:

1. Stephen Chapman, MATLAB Programming for Engineers, Cengage Learning, Technology & Engineering.
2. Matlab programming, Kirani Singh, B. B. Chaudhuri, Phi Learning Pvt. Ltd.
3. Essential MATLAB for scientists and engineers by Brian D. Hahn, Arnold, 2001, ISBN 0-7506524-0-3.

COURSE-XIII : MEDICAL IMAGING

COURSE OUTCOME

After taking this course the participants will have a basic understanding in the following areas like Knowledge of basic principles for medical imaging based using advanced image modalities: MRI, CT, Ultrasound and PET-CT, Knowledge of data analysis, image processing and post processing techniques for the different modalities, Knowledge of technological similarities and differences between the different modalities and choice of equipment for different clinical applications, Knowledge of ionizing radiation related risks and radiation protection principles in medical imaging, Knowledge of new applications and technology trends for the different modalities, Knowledge on how to analyse and assess a scientific article.

COURSE CONTENT:

Introduction to digital image processing techniques, sources of medical imaging- radiography images, x-ray computed tomography, magnetic resonance imaging, nuclear medicine imaging, ultrasound imaging, medical image analysis, manual and automated analysis, computational strategies for medical image analysis, spatial and frequency domain techniques for medical image analysis, discrete

transformation techniques, visualization techniques for diagnosis and therapy, techniques for image reconstruction, image enhancement, image restoration, image segmentation.

REFERENCES:

1. Fundamentals of Medical Imaging, Paul Suetens, Cambridge University Press.
2. Medical Image Processing, Reconstruction and Restoration: Concepts and Methods, Jiri Jan, CRC Press.
3. Medical image processing: the mathematics of medical imaging, James A. Green, Greenwood Research.
4. Handbook of Medical Image Processing and Analysis, Isaac Bankman, Academic Press.

COURSE-XIV : MICROPROCESSOR

COURSE OUTCOME

On completion of this course, the students will be able to understand the internal architecture and organization of 8086. Analyze the Assembly language programs of 8086, Analyze the internal architecture and real time control of 8051, Discuss the input / output, memory interface, Serial Communication and Bus Interface devices.

COURSE CONTENT:

8085 microprocessor, architecture, instruction set, addressing modes, memory organization & interfacing, Assembly language programming using *8085,* 8085 interrupts, 8255 PPL and its organization, 8254 programmable timer, organization & interfacing with *80S5,* 8279 keyboard & display, controller, organization & interfacing with 8085, analog & digital interfacing using 8255, keyboard/display interfacing using 8255 & 8279, Serial data transmission, DMA controller *8257 &* its organization, 8086/8088 microprocessor, architecture, instruction set, addressing modes, simple programs, memory organization and interfacing.

REFERENCES:

1. Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, PHI.
2. Microprocessor Architecture, Programming &Application - R. Gaonkar, Wiley Publications.
3. Advanced Microprocessor & Peripherals - Ray & Bhurchnadi, MH Publications.
4. Microprocessor & Interfacing - Hall, MH Publications
5. Fundamental of Microprocessor - Uday Kumar, Pearson Publications.
6. Microprocessor & Microcontroller - Krishnakant, PHI.
7. Microprocessor & Peripherals - Chowdhury & Chowdhury, Scitech. Publications.
8. 8085 Microprocessor Programming & Interfacing - N. K Srinath, PHI.
9. Microprocessor-Theory &Application - M. Rafiquezzaman, PHI.

COURSE-XV : MULTIMEDIA COMMUNICATION

COURSE OUTCOME

On completion of this course, the students have the following career options namely Advertizing Graphics, Animation & New Media, Computer Games Designer, Films And Video Conferencing, Freelancing Web Designing, Animator Art Director, Digital Effect Painter, Layout And Background Artist.

COURSE CONTENT:

Introduction to Multimedia and Communications - Media and Data Streams-Perception, representation, presentation of medium, Properties of multimedia system, Traditional data streams characteristics, **Sound/Audio** – Basic sound concepts, Music, MIDI concepts, devices, speech Generation, analysis, Transmission, **Images and Graphics**-Basic concepts, digital representation, image and graphics format, Image Synthesis, Analysis and Transmission, **Video and Animation**-TELEVISION, Computer based Animation, **Data Compression**- Basic Technology, Blocks, models and logical Data format, **Multimedia Operating System** - Real time, Resource management, Process management.

REFERENCES:

1. Multimedia Communications by Ralf Steinmetz and Klara Nahrstedz.
2. Multimedia Communications Technology by J R Ohm.
3. Multimedia Communications by Fred Halsall.

COURSE-XVI : NETWORK SECURITY

COURSE OUTCOME

The student will be able to learn the newer techniques involved with new technologies and newer challenges faced in the current trends.

COURSE CONTENT:

Authentication applications, Email security, IP security, Web security, Intruders, Malicious software, Firewalls.

REFERENCES:

1. Cryptography and Network Security, William Stallings, Pearson.
2. Cryptography and Network Security, Atul Kahate, Tata McGraw Hill.
3. Cryptography, Forouzan.

COURSE-XVII : PRACTICING SOFTWARE DESIGN

COURSE OUTCOME

An ability to use the techniques, skills, and modern engineering tools and processes necessary for software engineering practice. To apply software engineering perspective through software design and construction, requirements analysis, verification, and validation, to develop solutions to modern problems such as security, data science, and systems engineering.

COURSE CONTENT:

Principles and methods for software design with a special focus on object-oriented analysis and design, including topics such as domain modeling, software architecture, class and object modeling, behavioral modeling, design patterns, General Responsibility Assignment Software Principles (GRASP) design principles, design evaluation and improvement, and refactoring. Practice by designing a larger program.

REFERENCE BOOKS:

1. Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems. By: Martin Kleppmann.
2. RF Design Software Learning Kit: Step-By-Step Examples on Using ADS Software for an Introductory RF/Microwave Course. By :Keysight Technologies.

COURSE-XIX : SOFTWARE ENGINEERING CASE TOOLS

COURSE OUTCOME

Understand the importance of CASE tools in software development, the CASE repository, software engineering principles and techniques that are used in developing quality software products using CASE tools.

COURSE CONTENT:
CASE Concepts; Classification of CASE Tools; Steps for CASE Tool Implementation; Integrated CASE Environments; Architecture of CASE Environment.

REFERENCE BOOK:
1. Software Engineering: A practitioner's approach by Roger S. Pressman, 7th edition, McGraw-Hill International edition
2. Software Engineering by Ian Sommerville, 7th edition, Addison-Wesley.
3. Fundamentals of Software Engineering by Rajib Mall

COURSE-XX : SOFTWARE QUALITY TESTING

COURSE OUTCOME

Learn the definition of quality, cost of quality, quality model; apply white-box testing, black-box testing, and inspection techniques; know how test tools can be used in the testing life cycle; use testing metrics for product and process; understand how to do performance testing and usability testing.

COURSE CONTENT:
Software Quality Concepts: Software quality problems. Quality definition. Cost of quality, Quality model.

Code-based Testing Techniques: Control flow and data flow testing. Mutation testing. Symbolic evaluation. Domain testing.

Specification-based Testing Techniques: Equivalence partitioning. Boundary value analysis. Cause-effect graphing. Random testing. State machine testing. Formal program verification. Inspection Technique: Process, Role, Templates.

Management of Software Quality: Responsibility. Test cycle (unit, integration, system, alpha and beta testing phases). Design and code reviews. Test plans. Test tools. Qualitymetrics. Quality prediction. In-process quality tracking.

REFERENCE :

1. Jorgensen, P.C., 2013, Software Testing: A Craftsman's Approach, 4th Ed, Auerbach Publications.
2. Myers, G.J., Sandler, C., Badgett, T., 2011, The Art of Software Testing, 3rd Ed, Wiley.
3. McCaffrey, J.D., 2009, Software Testing: Fundamental Principles and Essential Knowledge, BookSurge Publishing.

COURSE-XXI : SYMANTEC WEB

COURSE OUTCOME

Understand the rationale behind Semantic Web. Model ontologies using Resource Description Framework (RDF).design RDF Schemas for ontologies. Model and design ontologies using Web Ontology Language (OWL). Query ontologies using SPARQL. Understand and reflect on the principles of Ontology Engineering. Make an association between Semantic web and Web 2.0. Apply Semantic web technologies to real world applications.

COURSE CONTENT:

Overview and Introduction, XML, RDF, FreeBase, DBPedia, RDF Schema, OWL, Knowledge Representation, Ontologies and Description Logic, OWL & Ontology Engineering / Protege Editor, OWL Formal Syntax, SW Programming, Semantic Web Methodologies and Design Patterns, SPARQL, Semantic Web Services, Linked Data and Publishing on the Semantic Web, Semantic Web Vocabularies and Applications.

REFERENCES:

1. Foundations of Semantic Web Technologies, Chapman & Hall/CRC Textbooks in Computing.
2. Semantic Web Programming, John Hebler, Matthew Fisher and others.
3. A Semantic Web Primer, Grigoris Antoniou, Paul Groth, Frank van Harmelen and Rinke Hoekstra.

COURSE-XXII : SYSTEM ANALYSIS AND DESIGN

COURSE OUTCOME

Understand the business needs in order to set requirements for the construction of information systems.

Acquire the knowledge of development process that takes into consideration user functionality and the construction of applicable models.

COURSE CONTENT:

Course topics will be as follows: Data & Information., Information Gathering., System Concepts., System Analysis and Design Life Cycle., Support System for Planning , Control and Decision Making., Tools for System Analysts., System design(input, output, files etc.,)., Prototype Development Strategy., System Implementation, Training and Maintenance., Complete System Analysis and Design Case Studies.

REFERENCES:

1. Analysis and Design of Information Systems, Second Edition, By: V. Rajaraman.
2. Analysis and Design of Information Systems, By: James A Senn McGraw Hill publications.
3. Gordon B Davis, By: Margrethe H Olson, McGraw Hill Publications.

COURSE-XXIII : THEORY OF COMPLEXITY

COURSE OUTCOME

Understand the concept of complexity of algorithms, different machine models for computations and their interrelation.

Explain the robustness of the complexity class P and be able to give an account of the P=NP problem; reduce a complete problem to a prescribed problem, for example SAT to CLIQUE.

Learn the hierarchy theorems, problems within different complexity classes, the proof of the Cook-Levin theorem, describe certain probabilistic algorithms, the theory to solve complexity problems arising in mathematics of computer science.

COURSE CONTENT:

Introduction- Time and space analysis of algorithms, Determining O, θ, Ω bounds of algorithms, Algorithms of various complexities; Lower bound theory-Lower bound determination using comparison trees, Lower bound calculation techniques for algebraic problems, Some lower bounds on parallel computation; NP-hard and NP-Complete problems- Basic concepts, Mp-Hard graph problems, NP-Hard scheduling problems, NP-Hard code generation problems; Approximation algorithms- Absolute approximations, $\in$-approximations, Polynomial time approximation methods, Probabilistically good algorithms.

REFERENCES:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.
2. The Design and Analysis of Computer Algorithms, Alfred V Aho, John E Hopcroft, Jeffrey D Ullman, Addison Wesley.

COURSE-XXIV : PROCESS AUTOMATION

COURSE OUTCOME

Understand the importance of automation, expectations from automation and applications in industry.

Understand the working of PLC, I/O modules of PLC, Programming languages and instructions of PLC, design PLC based application by proper selection and sizing criteria, developing GUI and ladder program.

Understand evolution and architecture of DCS, hierarchical control in DCS, programming DCS through function Block Diagram (FBD) method, SCADA architecture, communication in SCADA, develop any application based on SCADA along with GUI using SCADA software.

Understand the need of SIS, risk reduction methods, evaluation of SIL (Safety Integrity Levels)

COURSE CONTENT:

Introduction, Process, History, Mechanization, Organization Structure, Principles of automation, management automation, types of automation, Reasons for automation, Adapting Organization To New Technology, Impact of Automation on Industrial -Relations system, Impact of automation on education training and retraining, Case studies.

REFERENCES:

1. Designing Effective organisation , T Elaine Gagne & David K Banner , Sage Publication, California 1995.
2. The future of the Organisation, Colin Coulson Thomson, Kogan Page Limited, London 1997.
3. Organisation Learning, Micheal D Cohen, Lee S Sproull, Sage Publication, California 1996.

COURSE-XXV : PARALLEL COMPUTING ALGORITHMS

COURSE OUTCOME

The skills and abilities students should have acquired by the end of the course with the following outcomes determine how the general Student Outcomes apply specifically to this course.

Students demonstrate and apply parallel computing to a variety of applications in Mathematics and Engineering, have an ability to assess a problem presented to them, design a solution, and test their implementation. Students will be presented with problems and will have to design and implement solutions for those problems, will have an ability to discuss large scale machine design as well as applications and algorithms on those machines. Students will learn to use large scale parallel machines to solve problems as well as discuss the issues related to their construction and use.

COURSE CONTENT:

High Speed Computing, Parallel Computing, Temporal Parallelism, Data Parallelism, Pipe line, Vector Computers, Parallel Algorithms, Parallel programming, Issues with Compilers and Operating Systems, performance evaluation

REFERENCES:

1. Parallel Computer Architecture and Programming by V. Rajaraman and C. Siva Ram Murthy.

COURSE-XXVI : DATA CLUSTERING:

COURSE OUTCOME

On completion of this lesson the student shall be able to understand and apply a wide range of clustering, estimation, prediction, and classification algorithms, including k-means clustering, BIRCH clustering, define the following terms: divisive; agglomerative, monothetic, polythetic, distance, explain the difference between a hierarchical and a non-hierarchical classification, choose an appropriate distance measure, decide if data should be standardized before measuring distance. Explain the differences between cluster algorithms based on averages, distances, similarity and variance. Interpret the relationships between cases from a dendrogram. Judge the quality of a classification. Select alternative clustering solutions that are likely to improve the usefulness of an analysis.

COURSE CONTENT:

Data, Features, Feature Space, Data Normalization, Data Reduction, Proximity Indices and Similarity/Dissimilarity measures, Fuzzy Measures, Symbolic Measures, Clustering Strategies-Agglomerative Clustering, Divisive Clustering, Partitional Clustering, Cluster Validity, Applications of Data Clustering.

REFERENCES:

1. Anil K Jain, R. C. Dubes: Algorithms for Clustering Data.
2. Anil K Jain, M. N. Murthy and P. J. Flynn: Data Clustering-A Review.
3. Related Research Papers.

COURSE-XXVII : ADVANCED NUMERICAL ALGORITHMS

COURSE OUTCOME

The student will be able to apply the advanced methodologies learnt in this course for real world examples and also use them in the R & D area where its usage is very much appreciated and also required for easy and faster computation.

COURSE CONTENT:

Review of Algorithmic Complexity issues, Repetitive, Iterative and Recursive implementations, and Parallel implementations, Review of algorithm to solve $f(x) = 0$, solve simultaneous equations, Advanced issues – diagonal dominancy, simultaneous functions, linear programming problems, Differential equations, initial values, boundary values, Continuous system, Partial differential equation models – case studies – sequential verses parallel implementations.

REFERENCES:

1. Numerical Methods for Engineers by Steven Chapra and Raymond Canale.

COURSE-XXVIII : FUNDAMENTALS OF CONTROL SYSTEM

COURSE OUTCOME

The students will be able to model a physical system and express its internal dynamics and input-output relationships by means of block diagrams, mathematical model and transfer

functions. Understand and explain the relationships between the parameters of a control system and its stability, accuracy, transient behavior. Identify the parameters that the system is sensitive to. Determine the stability of a system and parameter ranges for a desired degree of stability. Plot the Bode, Nyquist, Root Locus diagrams for a given control system and identify the parameters and carry out the stability analysis. Determine the frequency response of a control system and use it to evaluate or adjust the relative stability, get introduced to the design a P, PD, PI, or PID controller based on the transient and steady state response criteria. Model and analyze the control systems using state space analysis.

COURSE CONTENT:

Concept of feedback and Automatic Control, Electrical analogy of physical system. Transfer Function, Block diagram representation of Control Systems, Block Diagram Algebra, Signal Flow Graph, Mason"s gain formula.

Control system components: Error sensing devices, potentiometer, synchros, D.C. and A.C. tachometers, servomotors, modulators and demodulators. Transient analysis of closed loop systems. Transient errors and their minimization, steady state error and their minimization, error coefficients, P, PI and P-I-D type controllers.

Stability of Control Systems: R-H criteria, Nyquist criteria, Bode Plots. Polar Plots, Nichols chart, measures of relative stability. Construction of Root Loci for simple system, effects of the movement of poles and zeros. Improvement of system performance through compensation. Case studies on control voltage, current, frequency position and speed. Control of liquid level, density, flow, temperature etc.

Reference:

1. Kuo B.C. Automatic Control System, PHI
2. Das Gupta S : Control System Theory ; Khanna Pub.
3. Nagrath I J &GopalM : Control Systems Engineering, New Age International Pub.

COURSE-XXIX : COMPUTER FORENSICS

COURSE OUTCOME

Understand the origin of forensic science, the difference between scientific conclusions and legal decision-making, the role of digital forensics and the relationship of digital forensics to traditional forensic science, traditional science and the appropriate use of scientific methods, outline a range of situations where digital forensics may be applicable, identify and explain at least three current issues in the practice of digital forensic investigations.

COURSE CONTENT:

Introduction to Computer Forensics: Introductory computer forensic courses teach students how to conduct forensic examinations, establish chains of custody, and how to handle and preserve digital media safely. Computer forensic students learn about the types of crimes associated with computer evidence, and they gain professional-level knowledge about related legal and privacy issues.

Cybercrime: This course familiarizes students with the types of crime that can occur through computers and the Internet, such as e-mail scams, identity theft, hacking, Internet harassment, and phishing. Students learn investigation techniques and discuss how cybercrime is changing and growing. Often, the course covers ways to present evidence in a cybercrime case.

Mobile Forensics: In this course, students will sharpen their skills concerning analyzing data found on mobile devices. Instructors will emphasize steps for conducting investigations and properly obtaining evidence for these types of cases. Students will also learn about digital and analog communications

networks and other related cellular technologies. Instructors may also address how to extract data from these devices using various techniques.

REFERENCES:

1. Digital Forensics and Cyber Crime by Joshua I James and Frank Breitinger
2. Forensics Computer Investigator, Digital Forensics Analyst, Job Interview Bottom Line Practical Questions and Answers by M Kumar
3. Practical Forensic Imaging by Bruce Nikkel
4. Digital Forensic and Cyber Crime by R K Jha

COURSE-XXX : BIOMETRICS

COURSE OUTCOME

Demonstrate knowledge engineering principles underlying biometric systems.

Analyze design basic biometric system applications.

COURSE CONTENT:

Fingerprint Identification Technology: Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width between two ridges -Fingerprint Image Processing – Minutiae Determination – Fingerprint Matching: Fingerprint Classification, Matching policies.

Face Recognition; Introduction, components, Facial Scan Technologies, Face Detection, Face Recognition, Representation and Classification, Kernel- based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition.

Fusion in Biometrics: Introduction to Multibiometric – Information Fusion in Biometrics – Issues in Designing a Multibiometric System – Sources of Multiple Evidence – Levels of Fusion in Biometrics – Sensor level, Feature level, Rank level, Decision level fusion – Score level Fusion.

REFERENCE :

1. James Wayman, Anil Jain, Davide Maltoni, Dario Maio, Biometric Systems, Technology Design and Performance Evaluation, Springer, 2005.
2. David D. Zhang, Automated Biometrics: Technologies and Systems, Kluwer Academic Publishers, New Delhi, 2000.
3. Arun A. Ross , Karthik Nandakumar, A.K.Jain, Handbook of Multibiometrics, Springer, New Delhi, 2006.
4. Paul Reid, Biometrics for Network Security, Pearson Education, 2004.
5. Nalini K Ratha, Ruud Bolle, Automatic fingerprint Recognition System, Springer, 2003
6. L C Jain, I Hayashi, S B Lee, U Halici, Intelligent Biometric Techniques in Fingerprint and Face Recognition CRC Press, 1999.
7. John Chirillo, Scott Blaul, Implementing Biometric Security, John Wiley, 2003.
8. S.Y. Kung, S.H. Lin, M.W.Mak, Biometric Authentication: A Machine Learning ApproachPrentice Hall, 2005

COURSE-XXXI . WEB PROGRAMMING

COURSE OUTCOME

Ability to implement an appropriate planning strategy for developing websites. Ability to produce functional, flexible, & versatile websites. Ability to locate, evaluate, & critically assess current & emerging technologies for developing websites. Possess a good working knowledge of HTML5 & CSS. Experience creating various small website projects. An awareness of the process in creating a website & the various roles needed in that process.

COURSE CONTENT:

Fundamentals of Web: Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; Security; the Web Programmers Toolbox. HTML: Origins and evolution of HTML; Basic syntax; Standard HTML document structure; Basic text markup, Hypertext Links; Lists; Tables; Forms; Frames. **Cascading Style Sheets (CSS):** 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; **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.**CGI Programming**: The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.

REFERENCES:

1. **Programming the World Wide Web** – Robert W. Sebesta, 4th Edition, Pearson Education,2008.
2. **Internet & World Wide Web How to H program** – M. Deitel, P.J. Deitel, A. B. Goldberg, 3rd Edition, Pearson Education / PHI, 2004.
3. **Web Programming Building Internet Applications** – Chris Bates, 3rd Edition, Wiley India, 2006.
4. **The Web Warrior Guide to Web Programming** – XueBai et al, Thomson, 2003.

COURSE-XXXII : OPEN SOURCE RESOURCES

COURSE OUTCOME

The student will have learnt the basics of developing Open Source Resource useful for anyone and everyone to access, modify and use for their own requirements and also promote the same for others to do what they want from it.

COURSE CONTENT:

Definition and scope, History, Advantages and disadvantages of Open Educational Resource, Licensing and types, OER policy, Research, Open Educational Practices, Costs, Institutional support, Initiatives, International programs, Major academic conferences, Critical discourse about OER as a movement, External discourse, Internal discourse

REFERENCES:

1. "George Mason University Libraries offers a one-stop searchbox for Open and Affordable Educational Resources"
2. "OpenStax textbook projects are developed and peer-reviewed by educators to ensure they are readable and accurate, meet the scope and sequence requirements of each course, are supported by instructor ancillaries, and are available with the latest technology-based learning tools."
3. "The College Open Textbooks Collaborative, a collection of twenty-nine educational non-profit and for-profit organizations, affiliated with more than 200 colleges, is focused on driving awareness and adoptions of open textbooks to more than 2000 community and other

two-year colleges." Includes Textbook Content Reviews submitted by educators & professionals in the field

COURSE-XXXIII : BUSINESS INTELLIGENCE

COURSE OUTCOME

Articulate modern concepts, theories, and research in the field of BI, Apply BI enabling technologies in organizational settings.

Articulate modern BI practices, including knowledge integration, sourcing and managing BI solutions.

Learn the social and ethical issues related to the use of Business Intelligence technologies in organizations.

Articulate the crucial role that Business Intelligence plays in careers as well as in business and society in the 21st century.

COURSE CONTENT:

Business Intelligence an Introduction, Business Intelligence Essentials, Business Intelligence Types, Architecting the Data, Introduction to Data Mining, Data Mining Techniques, Introduction to Data Warehousing, Knowledge Management, Data Extraction, Business Intelligence Life Cycle, Business Intelligence User Model, Business Intelligence Issues and Challenges, Business Intelligence Strategy and Road Map, Implementing Business Intelligence

REFERENCES:

1. Business Intelligence For Dummies By Swain Scheps.
2. Business Intelligence Guidebook: From Data Integration To Analytics By Rick Sherman.
3. Successful Business Intelligence, Second Edition: Unlock The Value Of BI & Big Data By Cindi Howson.

COURSE-XXIV : DISTRIBUTED COMPUTING

COURSE OUTCOME

Understand the principles on which the internet and other distributed systems are based. Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.

COURSE CONTENT:

Introduction to distributed systems (DS), Design goals, transparencies, fundamental issues, interconnection networks, Client server computing; Naming and binding, Distributed co-ordination, Process synchronization, Inter-process communication; Dead locks in distributed systems, Load Scheduling and balancing techniques, Agreement protocols; Distributed file system design, Distributed database system : A Case study

REFERENCES:

1. Andrew S Tanenbaum and Maarten van Steen : Distributed Systems: Princples and paradigms, PHI(2002)

2. T.L. Casavant and M. Singhal : Distributed Computing Systems, IEEE computing society press (1994)
3. M. Raynal and J. Howlett : Distributed algorithms and protocols, Wiley and Sons (1988)