### M. Sc. Tech. in Computer Science & technology (3 Years)

<table>
<thead>
<tr>
<th>Course Code &amp; Title</th>
<th>Credit Pattern (L: T: P)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hard Core Subjects</strong></td>
<td></td>
</tr>
<tr>
<td>MSCH1 Discrete Mathematics</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCH2 Principles of Programming &amp; Problem Solving</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCH3 Data Structures</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCH4 Computer Architecture</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCH5 Algorithmics</td>
<td>2:0:2</td>
</tr>
<tr>
<td>MSCH6 System Software</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCH7 Operating System</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCH8 Theory of Languages</td>
<td>2:1:0</td>
</tr>
<tr>
<td>MSCH9 Data Base Management System</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCH10 Computer Networks</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCH11 Computer Graphics</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCH12 Software Engineering</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCH13 Object Oriented Analysis and Design</td>
<td>2:0:2</td>
</tr>
<tr>
<td><strong>Soft Core Subjects</strong></td>
<td></td>
</tr>
<tr>
<td>MSCS1 Compiler Construction</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCS2 Graph Theory</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCS3 Data Communications</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCS4 Software Quality Assurance</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCS5 Multi-Data Analysis</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCS6 Research Methodology &amp; Documentation</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCS7 .Net Technology</td>
<td>2:0:2</td>
</tr>
<tr>
<td>MSCS8 Fuzzy Theory</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCS9 Image Processing</td>
<td>3:0:1</td>
</tr>
<tr>
<td>MSCS10 Information Retrieval</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCS11 Pattern Recognition</td>
<td>3:0:1</td>
</tr>
<tr>
<td>MSCS12 Probability and Distribution Theory</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCS13 Artificial Intelligence</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCS14 JAVA Programming</td>
<td>2:0:2</td>
</tr>
<tr>
<td>MSCS15 Operations Research and Optimization</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCS16 Simulation and Modeling</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCS17 Numerical Algorithms</td>
<td>2:0:2</td>
</tr>
<tr>
<td>MSCS18 Mobile Communication</td>
<td>3:1:0</td>
</tr>
</tbody>
</table>
Elective Subjects

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSCE1</td>
<td>Communication Skills and Professional Management</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCE2</td>
<td>Cryptography</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCE3</td>
<td>Data Analysis</td>
<td>3:0:1</td>
</tr>
<tr>
<td>MSCE4</td>
<td>Data Compression</td>
<td>3:0:1</td>
</tr>
<tr>
<td>MSCE5</td>
<td>Data Mining</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCE6</td>
<td>Data Indexing</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE7</td>
<td>Distribution Theory</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCE8</td>
<td>Embedded Systems</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE9</td>
<td>Advanced Data Structures</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE10</td>
<td>Hardware and Networking</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE11</td>
<td>Java Programming</td>
<td>2:0:2</td>
</tr>
<tr>
<td>MSCE12</td>
<td>MATLAB Programming</td>
<td>1:1:2</td>
</tr>
<tr>
<td>MSCE13</td>
<td>Medical Imaging</td>
<td>3:0:1</td>
</tr>
<tr>
<td>MSCE14</td>
<td>Microprocessor</td>
<td>3:0:1</td>
</tr>
<tr>
<td>MSCE15</td>
<td>Multimedia Communication</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCE16</td>
<td>Network Security</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE17</td>
<td>Numerical Algorithms</td>
<td>2:0:2</td>
</tr>
<tr>
<td>MSCE18</td>
<td>Practicing Software Design</td>
<td>1:1:2</td>
</tr>
<tr>
<td>MSCE19</td>
<td>Simulation and Modeling</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE20</td>
<td>Software Engineering Case Tools</td>
<td>1:1:2</td>
</tr>
<tr>
<td>MSCE21</td>
<td>Software Quality Testing</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE22</td>
<td>Symantec Web</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE23</td>
<td>System Analysis and Design</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCE24</td>
<td>Theory of Complexity</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCE25</td>
<td>Process Automation</td>
<td>2:1:1</td>
</tr>
<tr>
<td>MSCE26</td>
<td>Parallel Computing</td>
<td>3:1:0</td>
</tr>
<tr>
<td>MSCE27</td>
<td>Data Clustering</td>
<td>3:1:0</td>
</tr>
</tbody>
</table>

Note: The subjects in soft core list not taken as soft core can also be considered as elective subjects.
Detailed Syllabi for the M. Sc. Tech. course in Computer Science & Technology Course

HARD CORES

Discrete Mathematics

Objective:

Prerequisites:

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.

Principles of Programming Languages

Objective: This is to introduce the various programming paradigms existing with their role in solving problems by computers and selection of an appropriate language for solving a problem.

Prerequisites:


References:

Data Structures 3:0:1

Objective: To introduce the students to the concepts of data structures and its significance in solving problems. The course shall be taught keeping in mind that the learners are designers of data structures rather than its practitioners.

Prerequisites: Programming Fundamentals

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:

Computer Architecture 2:1:1

Objective:

Prerequisites:

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:

Algorithmics 3:1:1

Objective: This is to help the students to be able to understand apriori - analysis of an algorithm in a better way and learn to profile an algorithm and to be able to understand the design strategies and apply them and also get introduced to some advanced concepts

Prerequisites: A student should have gone through Programming and Data Structures courses before taking up this course

Course Content: Characteristic features of an algorithm, Apriori 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.

Systems Software 2:1:1

Objective: To introduce the students to the concepts of systems software and also get to study the designing principles of the various systems softwares.

Prerequisites: Digital Electronics, Computer Organization


References:

Operating Systems 3:1:0
**Objective:** Introducing the theories of the designing principles of a very important system software which helps

**Prerequisites:** Systems Software

**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:**

3. Operating System by Harvey M. Deitel, Addison Wesley, 1990

**Theory of Languages**

**Objective:** Introducing the theories of natural language acquisition and their importance to the artificial languages that had originated in computer science.

**Prerequisites:** Set theory

**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:**

2. An Introduction to Formal Languages and Automata by Peter Linz, Jones & Bartlett Learning, 01-Jan-2001.

**Data Base Management System**

**Objective:**

**Prerequisites:**

**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.

**Computer Networks**

**Objective:**

**Prerequisites:**

**Course Content:** A Communication Model, Data Communication, WAN, LAN, Protocols, TCP/IP Protocol Architecture, OSI Model, Standards, Characteristics, Functions, transmission

References:

Computer Graphics 2:1:1

Objective:

Prerequisites:

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

References:

Software Engineering 2:1:1

Objective:

Prerequisites:

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:
3. Rajib Mall – Fundamentals of Software Engineering, PHI.
Object Oriented Analysis and Design  

Objective:

Prerequisites: Basic programming concepts of C


References:


Soft Core

Compiler Construction  

Objective: This course is to introduce the concept of compilation and various stages in compilation with associate algorithmic models.

Prerequisites: Theory of formal languages
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.

Graph Theory

Objective: Appreciate and apply Graph theory to build models for problem solving and as a frame work for algorithm design. Design and Profile graph theoretic algorithms for some applications studies.

Pre requisites: Programming, Data Structures and Algorithms.

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, Tress, 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.

Data Communication

Objective: This course will allow students to develop background knowledge as well as core expertise in data communication technologies, which is one of the fastest growing industries in today’s world. The course, starts from the very basics of communication technology and goes up to the Internet, spanning all the five layers of TCP/IP model. The students will be exposed to communication principles, different types of media, modulation techniques, multiplexing, switched networks, the Internet, TCP/IP suite.

Prerequisites: Computer Networks

**References:**


**Software Quality Assurance**

2:1:1

**Objective:**

**Prerequisites:**

**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 system.

**References:**

3. Watts S. Humphrey, Managing the software process, Addison-Wesley.
Multi-Dimensional Data Analysis 2:1:1

Objective:

Prerequisites:

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.

Research Methodology & Documentation 3:1:0

Objective: The course is to familiarize the students with the foundations of research which are essential in taking up any research activity.

Prerequisites: Data Structures, Algorithms


References:

6. Related Research papers.

. Net Technology 2:0:2
Objectives: This allows the students to learn about Web development. Also this course will help them in the Development of projects like mini projects and major projects.

Prerequisites: Basic programming concepts of C & C++

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.

ADO.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.

Fuzzy Theory

Objective:

Prerequisites:

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:


Probability and Statistics
Objective:

Prerequisites:

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:
2. Probability and Statistics for Engineers by G.S.S. Bhishma Roa.

Pattern Recognition 3:0:1

Objective:

Prerequisites:

Course Content:

Image Processing 3:0:1

Objective:

Prerequisites:

Course content:
Information Retrieval 2:1:1

Objective: It is to introduce the concepts of different ways of archiving effectively a large corpus of data/information and to learn methods for Retrieval of relevant information for a given query. The course shall also cover some applications as case studies.

Prerequisites: Data Structures, Algorithms


References:

2. Recent Literature.

Artificial Intelligence 3:1:0

Objectives: To expose the learner to some topics of AI that includes search methods, theorem proving using the most widely used methods, more reasoning systems to reason with common statements which are often fuzzy and probabilistic, Expert systems, learning and planning.

Prerequisites:

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.
5. Introduction to Artificial Intelligence, Eugene Charnaik, Drew McDermott, AWL.

JAVA Programming

Objectives: Introduce the concept of object oriented programming and implementation of OOPs concepts using JAVA.

Prerequisites: Familiarity with at least one programming language and database concepts

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:


Operations Research and Optimization Techniques

Objectives: To introduce various optimization models useful for scientists and managers in decision making.

Prerequisites:
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:

2. Operations Research, R Panneer Selvam, EEE.

Simulation and Modeling

Objective: To introduce the theory and problems in various simulation models, make the learner understand the methods of generating random numbers and testing these, analyze the fitted models.

Prerequisites:

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:

3. System Simulation with Digital Computers, N. Deo, PHI.

Numerical Algorithms

Objective:
Prerequisites:

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:

2. R K Jain, P.K Iyengar “Numerical methods for scientist and engineers”.

Mobile Communication

Objectives: This course focuses on the objectives to understand the framework of TCP/IP, the current trends of Telecommunication Systems, applications of satellite systems, WLAN and Mobile Network layer.

Prerequisite Course: Computer Network, Data Communication


References:

2. S Stallings, W. “Wireless Communications and Networks”.
ELECTIVE SUBJECTS

Communication Skills and Professional Management 3:1:0

Objective: To groom the students as an overall professional.

Prerequisites: Basic English Language

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:
2. Communication for results – C Hamilton & Parker.
4. Basic Management skills for all – E H McGrath.

Cryptography 3:1:0

Objective:

Prerequisites: Computer Networks

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:
3. Cryptography, Forouzan.

Data Compression

Objectives: The goal of this course is to give students a conceptual understanding, and hands-on experience, of the state-of-the-art compression algorithms and approaches. These include both Lossless and Lossy compression techniques with an emphasis on widely deployed, standardized coding schemes.

Pre-requisites: Algorithmics

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:

Data Mining

Objective:

Prerequisites:


References:
Data Indexing

Objectives: This course is to introduce the students to the need for data indexing and various data indexing techniques available in the literature.

Pre-requisites: Fundamental of Data Structures and algorithms

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.

Distribution Theory

Objective:

Prerequisites:

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:


Embedded Systems

Objective: It is to learn the area of Embedded Systems with a focus to use VLSI technology to reduce overall system size and improve the performance of systems.
Prerequisites: Computer Organization, Programming Concepts.


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

Advanced Data Structures 2:1:1

Objective: It is to learn and practice recent developments in the field of data representation and organization along with the associated algorithms with an emphasis on spatial data structures.

Prerequisites: Course on Data Structures, Algorithmics

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.
3. Related research papers.

Hardware and Networking 2:1:1

Objective:

Prerequisites: Basic Concepts, Digital Electronics, Computer Organization.
**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.

**MATLAB Programming**

**Objectives:** This course is to introduce the students to the use of a high-level programming language, Matlab, for scientific problem solving with applications and examples from mathematics, statistics and the natural sciences.

**Prerequisites:** Programming in C, Matrix Algebra

**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:**


**Medical Imaging**

**Objectives:** A comprehensive introduction to the major aspects of standard medical imaging systems used today and to introduce the fundamental approaches for processing of different types of medical images.

**Prerequisites:** Fundamentals of Digital Image Processing, Matrix Algebra
**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.
3. Medical image processing: the mathematics of medical imaging, James A. Green, Greenwood Research.

**Microprocessor**

**Objective:** This course introduces students to interpret, analyze, verify, and troubleshoot fundamental microprocessor circuits and programs using appropriate techniques and test equipment.

**Prerequisites:**

**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 8085, 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:**

4. Microprocessor & Interfacing - Hall, MH Publications
5. Fundamental of Microprocessor - Uday Kumar, Pearson Publications.
6. Microprocessor & Microcontroller - Krishnakant, PHI.
Multimedia Communication 3:1:0

Objective:

Prerequisites: Computer Networks, Data Communication, Multimedia Database.


References:
1. Multimedia Communications by Ralf Steinmetz and Klara Nahrstedz.
3. Multimedia Communications by Fred Halsall.

Network Security 2:1:1

Objective:

Prerequisites:

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

References:
3. Cryptography, Forouzan.
Advanced Numerical Algorithms

Objective:

Prerequisites:

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.

Practicing Software Design

Objective:

Prerequisites:

Course Content:

References:

Software Engineering Case Tools

Objective:

Prerequisites:
Course Content:

References:

Software Quality Testing 2:1:1

Objective:

Prerequisites:

Course Content:

References:

Symantec Web 2:1:1

Objective:

Prerequisites:


References:

3. A Semantic Web Primer, Grigoris Antoniou, Paul Groth, Frank van Harmelen and Rinke Hoekstra.

System Analysis and Design 3:1:0
**Objectives:** This course is intended to give the students both knowledge about various issues concerned with a system’s analysis as well as its design, techniques taught in the class will be applied on substantial team assignments.

**Prerequisites:**


**References:**


**Theory of Complexity**

3:1:0

**Objective:**

**Prerequisites:**

**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, ε-approximations, Polynomial time approximation methods, Probabilistically good algorithms.

**References:**

Process Automation

Objective: Process Automation is the most important development in modern technology for operating various industries. This course provides a broad overview of Control and Automation for designing various plants.

Prerequisite: Knowledge of working with software packages.


References:

Parallel Computing

Objective:

Prerequisites:


References:

Data Clustering:
**Objective:** This course is to make the learners understand categorization of data into groups based on their features, thro identification of natural groups in the population. The target is to deal with algorithms for clustering data.

**Prerequisites:** Data Structures and Algorithm.

**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:**