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

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	2:1:0
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	2:0:2

Soft Core Subjects

MSCS1	Compiler Construction	2:1:1
MSCS2	Graph Theory	3:1:0
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 Distribution Theory	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	Distribution Theory	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	MATLAB 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	Numerical Algorithms	2:0:2
MSCE18	Practicing Software Design	1:1:2
MSCE19	Simulation and Modeling	2:1:1
MSCE20	Software Engineering Case Tools	1:1:2
MSCE21	Software Quality Testing	2:1:1
MSCE22	Symantec Web	2:1:1
MSCE23	System Analysis and Design	3:1:0
MSCE24	Theory of Complexity	3:1:0
MSCE25	Process Automation	2:1:1
MSCE26	Parallel Computing	3:1:0
MSCE27	Data Clustering	3:1:0

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 3:1:0

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.
2. Discrete Mathematics by Kolman & Busby.

Principles of Programming Languages 2:1:1

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:

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.

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:

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.

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:

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.

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, 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.

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

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.

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:

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.

Theory of Languages 3:0:1

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:

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.

Data Base Management System 2:1:1

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.
3. Database Systems: The Complete Book by: Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Wisdom.

Computer Networks 2:1:1

Objective:

Prerequisites:

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.

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:

1. Computer Graphics by Hearn & Baker.

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:

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.

Object Oriented Analysis and Design 2:0:2

Objective:

Prerequisites: Basic programming concepts of C

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

Compiler Construction 2:1:1

Objectives: 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.
2. Andrew W Apple, modern complier implementation in c, Cambridge university press, 1997.
3. Kenneth C Louden, Complier construction principles, Thomson Education, 1997.

Graph Theory 3:1:0

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 3:1:0

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

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.

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 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.

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

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.

. 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.

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.

Fuzzy Theory 3:1:0

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:

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.

Probability and Statistics 3:1:0

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:

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

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.

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.
4. Artificial Intelligence, Nils J Nilson, Elsevier, Morgan Kaufmann.
5. Introduction to Artificial Intelligence, Eugene Charnaik, Drew McDermott, AWL.

JAVA Programming 2:0:2

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:

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.

Operations Research and Optimization Techniques 3:1:0

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:

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

Simulation and Modeling 3:1:0

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:

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.

Numerical Algorithms 2:0:2

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:

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.

Mobile Communication 3:1:0

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

Prerequisite Course: Computer Network, Data Communication

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

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:

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.

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:

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

3. Cryptography, Forouzan.

Data Compression 3:0:1

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:

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

Data Mining 3:1:0

Objective:

Prerequisites:

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.

Data Indexing 2:1:1

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 3:1:0

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:

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

Embedded Systems 2:1:1

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.

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.

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.
2. Jean-Paul Tremblay, P. G. Sorenson – An introduction to data structures with applications, McGraw-Hill, 1984 – Computers.
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 3:0:1

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:

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.

Medical Imaging 1:1:2

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.
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.

Microprocessor 2:0:2

Objective: This course introduces to the 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 *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.

Multimedia Communication 3:1:0

Objective:

Prerequisites: Computer Networks, Data Communication, Multimedia Database.

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.

Network Security 2:1:1

Objective:

Prerequisites:

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.

Advanced Numerical Algorithms 2:0:2

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 1:1:2

Objective:

Prerequisites:

Course Content:

References:

Software Engineering Case Tools 1:1:2

Objective:

Prerequisites:

Course Content:

References:

Software Quality Testing 2:1:1

Objective:

Prerequisites:

Course Content:

References:

Symantec Web 2:1:1

Objective:

Prerequisites:

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.

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:

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.

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, $\in$-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.

Process Automation 2:1:1

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.

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.

Parallel Computing 2:1:1

Objective:

Prerequisites:

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.

Data Clustering: 3:1:0

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:

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.