

**MRSPTU POST GRADUATE OPEN ELECTIVES-I 2016 BATCH ONWARDS  
(UPDATED ON 5.3.2017)**

<b>PG OPEN ELECTIVES-I 2016 BATCH ONWARDS</b>		
Internal	External	Total
40	60	100

**NOTE: MORE COURSES MAY BE ADDED IN THIS LIST LATER ON**

<b>PG OPEN ELECTIVES-I 2016 BATCH ONWARDS</b>		
<b>COURSE CODE</b>	<b>COURSE</b>	<b>NOT APPLICABLE FOR PROGRAMMES</b>
MITE0-F91	Software Project Management	M.Tech. IT, M.Tech. IT & CW, M.Sc. IT
MCSE0-F91	Soft Computing	M.Tech. CSE, M.Tech. CSE (Software Engineering), M.Tech. CSE (Computer Network and Information Security), M.Tech. CSE (E-Security), M.Sc. CSE
MCSE0-F92	Big Data Analytics Concepts	
MCSE0-F93	Management Information System	
MCSE0-F94	Advanced Data Structures	
MBAD0 - F91	Principles and Practices of Management	
MBAD0 - F92	Total Quality Management	
MBAD0 - F93	Human Resource Management	
MBAD0 - F94	Marketing Management	
MBAD0 - F95	Project Management	
MTEX0-F91	Textile Chemistry-I	M.Tech. Textile Engg.
MCAP0-F91	Computer Applications in Business	MCA, PGDCA
MPHY0-F91	Physics of Materials	M.Sc. Physics
MMAT0-F91	Statistical Methods	M.Sc. Mathematics
MMEE0-F91	Industrial Safety & Environment	M.Tech. Mech. Engg., M.Tech. ME (Automation & Robotics), M.Tech. ME (CAD/CAM), M.Tech. ME (Industrial & Production), M.Tech. ME (Production), M.Tech. ME (Thermal Engg.)
MMEE0-F92	Supply Chain Management	
MCIE0-F91	Environment Management	M.Tech. Civil Engg., M.Tech. CE (Infrastructural Engg.), M.Tech. CE (Geotechnical Engg.), M.Tech. (Structural & Foundation Engg.), M.Tech. CE (Construction

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		Technology Management), M.Tech. CE (Structure Engg.)
MCHM0-F91	Oils and Fats	M.Sc. Chemistry
MECE0-F91	Computer Networks	M.Tech. Electronics & Instrumentation, M.Tech. ECE (Microelectronics), M.Tech. ECE (Embedded System), M.Tech. ECE (Signal Processing)
MECE0-F92	Digital Signal Processing	
MECE0-F93	Sensors & Transducers	
MECE0-F94	Electronic System Design	
MECE0-F95	Digital Circuits & Logic Design	

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**SOFTWARE PROJECT MANAGEMENT**

**Course Code: MITE0-F91**

**L T P C**

**Contact Hrs.**

**3 0 0 3**

**Unit-1**

Project Management Fundamentals- Basic Definitions, Project Stakeholders and Organizational, Influences on Project Management, Project Management Processes, Project Initiating Processes

**Unit-2**

Planning and Resourcing a Project - Identifying Requirements, Creating the Work Breakdown structure, Developing the Project Schedule, developing a Project Cost Estimate, Planning Quality, Organizing the Project Team, Planning for Potential Risks

**Unit-3**

Executing and Managing a Project - Project Executing Processes- Acquiring and Developing the Project Team, Managing the Project Team, Managing Stakeholder Expectations, Directing and Managing the Project while assuring Quality

**Unit-4**

Project Monitoring and Controlling Processes - Verifying and Controlling Scope, Managing Schedule and Cost, Controlling Quality, Monitoring and Controlling Risks. Integrated Change Control, Project Closing Process - Closing a Project

**Recommended Books:**

1. Software Engineering - Somerville (Addison Wesley)
2. Software Engineering-Pressmen.

**SOFT COMPUTING**

**Subject Code-MCSE0-F91**

**L T P C**

**Duration – 45 hrs**

**3 0 0 3**

**COURSE OBJECTIVES**

The objective of this course is to teach basic neural networks, fuzzy systems, Genetic Algorithms and optimization algorithms concepts and their relations.

**COURSE OUTCOMES**

**CO1:** Able to comprehend techniques and applications of Soft Computing in real world problems.

**CO2:** Able to follow fuzzy logic methodology and design fuzzy systems for various applications.

**CO3:** Able to design feed forward Artificial Neural Networks (ANN) and implement various methods of supervised learning.

**CO4:** Able to design feedback Artificial Neural Networks (ANN) and implement various methods of unsupervised learning

**CO5:** Able to appreciate the methodology of GA and its implementation in various applications.

**COURSE CONTENT**

**UNIT-I (11 hrs)**

**Soft Computing:** Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

**Fuzzy Logic:** Fuzzy set versus crisp set, basic concepts of fuzzy sets, membership functions, basic operations on fuzzy sets and its properties. Fuzzy relations versus Crisp relation.

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**Fuzzy rule base system:** Fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, Fuzzy Inference Systems (FIS) – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models, Fuzzification and Defuzzification, fuzzy decision making & Applications of fuzzy logic.

**UNIT-II (12 hrs)**

**Structure and Function of a single neuron:** Biological neuron, artificial neuron, definition of ANN and its applications. Neural Network architecture: Single layer and multilayer feed forward networks and recurrent networks. Learning rules and equations: Perceptron, Hebb's, Delta, winner take all and out-star learning rules. Supervised Learning Network: Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, Back Propagation Network, Associative memory networks, Unsupervised Learning Networks: Competitive networks, Adaptive Resonance Theory, Kohonen Self Organizing Map

**UNIT-III (11 hrs)**

**Genetic algorithm:** Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: selection operator, cross over, mutation operator, Stopping Condition and GA flow, Constraints in GA, Applications of GA, Classification of GA.

**UNIT-IV (11 hrs)**

**Hybrid Soft Computing Techniques:** An Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid systems, Genetic fuzzy Hybrid and fuzzy genetic hybrid systems

**RECOMMENDED BOOKS**

1. S, Rajasekaran & G.A. Vijayalakshmi Pai, 'Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications', 1<sup>st</sup> Ed., PHI Publication, **2003**.
2. S.N. Sivanandam & S.N. Deepa, 'Principles of Soft Computing', 2<sup>nd</sup> Ed., Wiley Publications, **2008**.
3. Michael Negnevitsky, 'Artificial Intelligence', 2<sup>nd</sup> Ed., Pearson Education, New Delhi, **2008**.
4. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', 3<sup>rd</sup> Ed., Wiley, **2011**.
5. Bose, 'Neural Network fundamental with Graph, Algorithm. & Application', TMH, **2004**.
6. Kosko, 'Neural Network & Fuzzy System', 1<sup>st</sup> Ed., PHI Publication, **2009**.
7. Klir & Yuan, 'Fuzzy sets & Fuzzy Logic: Theory & Application', PHI, **1995**.
8. Hagen, 'Neural Network Design', 2<sup>nd</sup> Ed., Cengage Learning, **2008**.

**BIG DATA ANALYTICS AND CONCEPTS**

**Subject Code: CSE0-F92**

**L T P C  
3 0 0 3**

**Duration – 45 hrs**

**COURSE OBJECTIVE**

**COURSE OUTCOMES**

**COURSE CONTENT**

**UNIT-I (10 Hrs)**

**Introduction to Big Data** – Distributed File system – Big Data and Its importance, Traits of Big Data, Challenges of Conventional System, Web Data, Four V's, Drivers for Big data, Big Data Analytics, Applications of Big Data

**Introduction to Map Reduce:** The Map Tasks, Grouping by Key, The reduce Tasks, Combiners, Details of Map Reduce Execution, Coping with Node Failures. Algorithms Using Map Reduce: Matrix-Vector Multiplication, Computing Selections and Projections, Union, Intersection, and Difference, Natural Join.

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**UNIT-II (12 Hrs)**

**Introduction to Hadoop** - Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

**Hadoop Architecture** - Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

**UNIT-III (9 Hrs)**

**HADOOP Ecosystem:** Hadoop Ecosystem Components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features - Name Node High Availability, HDFS Federation, MRV2

**YARN Architecture:** Background of YARN, Advantages of YARN, Different Commands in YARN, Running MRVL in YARN

**UNIT –IV (9 Hrs)**

**HIVE** – HIVE Architecture and Installation, Comparison with Traditional Database,

**HIVEQL** - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Sub -queries

**HBASE Concepts**- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBASE uses Zookeeper and how to Build Applications with Zookeeper

**Recommended Books**

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, ‘Professional Hadoop Solutions’, Wiley Publications, 2015
2. Chris Eaton, Dirk deroos et al. , ‘Understanding Big data’, McGraw Hill, 2012
3. Tom White, “HADOOP: The definitive Guide”, O Reilly 2012
4. Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing 2013
5. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014

**MANAGEMENT INFORMATION SYSTEM**

**Course Code: MCSE0-F93**

**L T P C  
3 0 0 3**

**Contact Hrs. 45**

**COURSE OBJECTIVE**

The objective of this course is to introduce the students to the Management Information Systems and its application in organizations. The course would expose the students to the managerial issues relating to information systems and help them identify and evaluate various options in Management Information Systems.

**COURSE OUTCOMES**

**CO1** Students would be able to understand the usage of MIS in organizations and the constituents of the MIS.

**CO2** Effectively using and administrating information Systems in different business settings **CO3** to illustrate how current technologies and decision- support tools can be utilized to the advantage of business operations

**CO4** to explain fundamental concepts of data communications, computer networking and the related hardware

**COURSE CONTENT**

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**UNIT-I (10 hrs)**

**Introduction:** Definition information system, role and impact of MIS, the challenges of Information system, Nature of MIS, Characteristics of MIS, Myths regarding MIS, Requirements of MIS, Problems & Solutions in implementing MIS, Benefits of MIS, Limitations of MIS, Significance of MIS, Components of MIS. Role of MIS, Major Management challenge to building and using information system in Organization, functions of management.

**UNIT-II (12 hrs)**

**Information system and Organizations:** The relationship between Organization and Information System, Information needs of different organization levels: Information concept as quality product, classification and value of information, methods of data and information collection. Strategic role of information system, Salient features of Organization, Information, management and decision making, How Organization affect Information Systems, How Information system affect Organization, Ethical and Social impact of information system.

**UNIT-III (12 hrs)**

**Business application of Information System:** Foundation Concepts Information systems in Business: Information system and technology, Business Applications, Development and Management. The internet networked E-business Enterprise: Internet, and Extranet in business. Electronic Commerce System: Electronics commerce Fundamentals, Commerce Application and issues. E-business Decision Support: Decision support in E-Business, Artificial Intelligence Technologies in business.

**UNIT-IV (11 hrs)**

**Technical Foundation of Information System:** Computers and information processing, Computer Hardware, Computer software, Managing data resources, Telecommunication, Enterprise: wide computing and networking.

**Strategic and Managerial Implications of Information Systems:** Strategic Information System: Introduction, Characteristics of Strategic Information Systems, Strategic Information Systems (SISP), Strategies for developing an SIS, Potential Barriers to developing a Strategic Information System (SIS), Decision Support System (DSS): Decision making concepts, methods, tools and procedures. Managing Information Resources: Introduction, IRM, Principal of Managing Information Resources, IRM functions, Computer Security: Introduction, Computer Security, Types of Computer Security, Disaster Recovery Plan.

**Recommended Books:**

1. W.S. Jawadakar, 'Management Information System', 3<sup>rd</sup> Ed, McGraw Hill, 2006
2. J. O. Brien, 'Management Information System', 9<sup>th</sup>, TMH, 2008.
3. Uma G, Gupta, 'Management Information System' 5th Ed TMH.
4. Kenneth C. Laudon, 'Management Information System Organisation and Technology' 14<sup>th</sup>, TMH, 2016.
5. Jane P. Laudon, Kenneth C. Laudon, 'Essentials of Management Information System', 11<sup>th</sup> ed, Pearson, 2017.

**ADVANCED DATA STRUCTURES AND ALGORITHMS**

**Subject Code-MCSE0-F94**

**L T P C  
3 0 0 3**

**Duration – 45 hrs**

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**COURSE OBJECTIVES**

To learn the advanced concepts of data structure and algorithms and its implementation. The course has the main ingredients required for a computer science graduate and has all the necessary topics for assessment of data structures and algorithms.

**COURSE OUTCOMES**

CO1 Ability to apply and implement various data structures to algorithms and to solve problems.  
CO2 Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency class.

CO3 Ability to apply various traversing, finding shortest path and text pattern matching algorithm.  
CO4 Know the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems.

**COURSE CONTENT:**

**UNIT-I (12 hrs)**

**Introduction to Basics:** Significance and need of various data structures and algorithms, Arrays, Linked lists, Stacks, Queues, Priority queues, Heaps; Strategies for choosing the appropriate data structures.

**Advanced Data Structures:** Binary Search Tree, AVL Trees, Red-Black Trees, Splay Trees, B-trees, Fibonacci heaps, Data Structures for Disjoint Sets, Augmented Data Structures.

**UNIT-II (11 hrs)**

**Algorithms Complexity and Analysis:** Probabilistic Analysis, Amortized Analysis, Competitive Analysis, Internal and External Sorting algorithms: Quick Sort, Heap Sort, Merge Sort, Counting Sort, Radix Sort.

**UNIT-III (11 hrs)**

**Graphs & Algorithms:** Representation, Type of Graphs, Paths and Circuits: Euler Graphs, Hamiltonian Paths & Circuits; Cut-sets, Connectivity and Separability, Planar Graphs, Isomorphism, Graph Coloring, Covering and Partitioning, bridges, Depth- and breadth-first traversals, Minimum Spanning Tree: Prim's and Kruskal's algorithms, Shortest-path Algorithms: Dijkstra's and Floyd's algorithm, Topological sort, Max flow: Ford-Fulkerson algorithm, max flow – min cut.

**String Matching Algorithms:** Suffix arrays, Suffix trees, Brute Force, Rabin-Karp, Knuth-Morris-Pratt, Boyer-Moore algorithm.

**UNIT-IV (11 hrs)**

**Approximation algorithms:** Need of approximation algorithms: Introduction to P, NP, NP-Hard and NP-Complete; Deterministic, non-Deterministic Polynomial time algorithms; Knapsack, TSP, Set Cover, Open Problems.

**Randomized algorithms:** Introduction, Type of Randomized Algorithms, 2-SAT; Game Theoretic Techniques, Random Walks.

**RECOMMENDED BOOKS:**

1. E. Horowitz, S.Sahni and Dinesh Mehta, 'Fundamentals of Data structures in C++', Galgotia, 1999.
2. Thomas H.Corman, Charles E.Leiserson, Ronald L. Rivest, 'Introduction to Algorithms', 3<sup>rd</sup> Ed., PHI, 2009.
3. Adam Drozdex, 'Data Structures and algorithms in C++', 2<sup>nd</sup> Ed., Thomson learning – vikas publishing house, 2001.
4. G. Brassard and P. Bratley, 'Algorithmics: Theory and Practice', Prentice –Hall, 1988.

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**PRINCIPLES AND PRACTICES OF MANAGEMENT**

**Subject Code: MBAD0-F91**

**L T P C  
3 0 0 3**

**Duration: 40 Hrs**

**Learning Objectives:** This course aims to provide a thorough and systematic coverage of management theory and practice. The course aims at providing fundamental knowledge and exposure of the concepts, theories and practices in the field of management. It focuses on the basic roles, skills and functions of management, with special attention to managerial responsibility for effective and efficient achievement of goals.

**UNIT-I (10 Hrs)**

**Introduction to Management:** Definition, Nature, Significance and Scope. Functions of Manager, An Overview of Management Functions. Is managing a science or art? Evolution of Management Thought: Classical Approach, Scientific Management, General Administrative Theory, Quantitative Approach, Behavioral Approach, System approach and Contingency approach.

**UNIT-II (10 Hrs)**

**Planning and Decision Making:** Types of Plans and Process of Planning, Nature of Objectives, Setting Objectives. Importance and Steps in Decision Making, Types of Decision and Decision Making Under Different Conditions. Group Decision Making. Decision Making Styles

**Organizing:** Nature and Significance, Process of Organizing, Bases of Departmentation, Delegation and Decentralization, Line & Staff relationship

**Delegation:** Concept and Elements. Authority, Responsibility, Accountability

**UNIT-III (10 Hrs)**

**Coordination:** Concept and Importance, Factors which Make Coordination Difficult, Techniques or Methods to Ensure Effective Coordination.

**Control:** Concept, Planning-Control Relationship, Process of Control, Traditional & Modern Techniques of Control

**UNIT-IV (10 Hrs)**

**Management by Objectives:** Concept, Benefits and Weaknesses, Comparative Study of Indian, Japanese and American Management Culture

**Current Trends in Management Practices:** Workforce Diversity, e-Business

**Course Outcomes:** After completing the course student will be able to understand and explain the concept of management and its managerial perspective. It will equip students to map complex managerial aspect arise due to ground realities of an organization. They will Gain knowledge of contemporary issues in Management principles and various approaches to resolve those issues.

**Recommended Books**

1. Heinz Wehrich, Cannice & Koontz, 'Management (A Global Perspective)', Tata McGraw Hill.
2. Harold Koontz, and Heinz Wehrich, 'Essentials of Management: An international Perspective', Tata McGraw Hill.
3. Stephen Robbins & Mary coulter, 'Management', Pearson Education
4. VSP Rao & VH Krishna, 'Managemen't', Excel Books
5. P. Subba Rao, 'Principles of Management', Himalaya Publishing



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**TOTAL QUALITY MANAGEMENT**

**Subject Code: MBAD0-F92**

**L T P C  
3 0 0 3**

**Duration: 40 Hrs**

**UNIT-I (10 Hrs)**

**Quality and Total Quality Management:** Excellence in manufacturing/service, factors of excellence, relevance of TQM. Concept and definition of quality: Total quality control (TQC) and Total Quality Management (TQM), salient features of TQC and TQM. Total Quality Management Models, benefits of TQM

**UNIT-II (10 Hrs)**

**Just-in-time (JIT):** Definition: Elements, benefits, equipment layout for JIT system, Kanban system MRP (Material Requirement planning) vs JIT system, Waste elimination, workers involvement through JIT: JIT cause and effect chain, JIT implementation.

**Customer:** Satisfaction, data collection and complaint, Redressal mechanism.

**UNIT-III (10 Hrs)**

**Planning Process:** Policy development and implementation; plan formulation and implementation.

**Process Management:** Factors affecting process management, Quality function development (QFD), and quality assurance system.

**Total Employees Involvement (TEI):** Empowering employees: team building; quality circles; reward and Recognition; education and training, Suggestion schemes.

**UNIT-IV (10 Hrs)**

**Problems solving:** Defining problem, Problem identification and solving process, QC tools.

**Benchmarking:** Definition, concept, process and types of benchmarking

**Quality Systems:** Concept of quality system standards: relevance and origin of ISO 9000; Benefits; Elements of ISO 9001, ISO 9002, ISO 9003.

**Advanced techniques of TQM:** Design of experiments: failure mode effect analysis: Taguchi methods.

**Recommended Books**

1. Sunder Raju, 'Total Quality Management', Tata McGraw Hill.
2. M. Zairi, 'TQM for Engineers', Aditya Books.
3. J.L. Hradeskym, 'Total Quality Management Handbook', McGraw Hill.
4. Dalela and Saurabh, ISO 9000 quality System, Standard Publishers.

**HUMAN RESOURCE MANAGEMENT**

**Subject Code: MBAD0-F93**

**L T P C  
3 0 0 3**

**Duration: 45 Hrs**

**Course Objectives:** The objective of the paper is to make student aware of the various functions and importance of the HR department in any organization. It is basically concerned with managing the human resources, whereby the underlying objective is to attract retain and motivate the human resources in any organization, which is the most challenging and daunting look for any organization today.

**UNIT-I (10 Hrs)**

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Human Resources Management: Meaning, Scope, Objective, Functions, Roles and Importance. interaction with other functional areas. HRM & HRD a comparative analysis. Human Resource Planning: Meaning, Process & Methods of Human Resources Planning, Importance of HRIS. Job Analysis, Job Description, Job Specification. Concept of Job Evaluation

**UNIT-II (10 Hrs)**

Recruitment & Selection: Concept, Process & Methods. Concept of Induction & Placement. Training & Development: Concept & Methods, Difference Between Training & Development, Internal Mobility: Promotion, Transfer, Demotion, Separation.

**UNIT-III (10 Hrs)**

Performance Appraisal: Concept, methods & Process. Compensation Management- Wage & Salary Administration, Elements & Methods of Wage & Salary, Incentive Plans & Fringe Benefits, Quality of work life (QWL): Meaning, Development and Various Approaches of QWL, Techniques for improving QWL.

**UNIT IV (10 Hrs)**

Industrial Relations: Meaning and importance. Collective Bargaining, Participative Management, Employee Grievances and their Resolution, Quality Circles, HR Audit, Contemporary Issues in HRM, Trade Union in India, Safety Provisions under Factories Act 1948, Social Security, ESI Act 1948

**Course Outcomes:** After completing this course the students should be able to understand the concepts, principles and processes of HRM, understand the crucial role that HRM plays in helping organizations all over the world adapt to the endless change today.

**Recommended Books**

1. Edwin B.Flipppo, 'Personal Management', Tata McGraw Hill
2. Bohlander, Snell & Vohra, 'Human Resource Management', Cengage Learning
3. Gary Dessler, 'Human Resource Management', McMillan
4. V.S.P.Rao, 'Human Resource Management', Excel Books
5. C.B. Mamoria, 'Personal Management', Himalaya Publications
6. T.N. Chhabra, 'Human Resource Management', Dhanpat Rai & Sons
7. C.B. Gupta, 'Human Resource Management', Sultan Chand and Sons
8. R.S. Dwivedi, 'HRD in India Companies', Himalaya Publications

**MARKETING MANAGEMENT**

**Subject Code: MBAD1-F94**

**L T P C**  
**3 0 0 3**

**Duration: 40 Hrs**

**Objectives:** The course aims at making students understand concepts, philosophies, processes and techniques of managing the marketing operations of a firm in turbulent business environment. This course will provide better understanding of the complexities associated with marketing functions, strategies and provides students with the opportunity to apply the key concepts to practical business situations.

**UNIT-I (10 Hrs)**

**Understanding Marketing and Consumers:** Definition, Importance, Scope, Various Marketing Concepts, Marketing Mix, Marketing vs Selling

**Consumer Behaviour:** Understanding Consumer Behaviour, Factors Influencing Consumer Buying Behaviour, Business Buying Process, Understanding Business Buyer Behaviour.

**UNIT-II (10 Hrs)**

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**Creating and Managing Product:** Market Segmentation, Differentiation, Targeting and Positioning, Competitors Analysis.

**Product Decisions:** Product Mix, New Product Development, Product Life Cycle and Strategies.

**Pricing Decisions:** Objectives, Factors Affecting Pricing Decisions, Pricing Methods, Pricing Strategies

**UNIT-III (10 Hrs)**

**Delivering and Promoting Product:** Supply Chain Decisions: Nature, Types, Channel Design and Channel Management Decisions, Retailing, Wholesaling, Managing Logistics and Supply Chain.

**Promotion Decisions:** Communication Process, Promotion Mix

**UNIT-IV (10 Hrs)**

**Emerging Trends in Marketing:** Green Marketing, Network Marketing, Direct Marketing, Social Marketing, Viral Marketing, Customer Relationship Management (CRM), Rural Marketing

**E-Commerce:** Marketing in The Digital Age.

Note: Relevant Case Studies should be discussed in class.

**Recommended Books**

1. Kotler & Koshy, 'Marketing Management', Pearsons Education
2. Ramaswamy & Nama kumari, 'Marketing Management', McMillan
3. Etzel, Walker, Stanton, and Pandit, 'Marketing Management', Tata McGraw Hill
4. Kurtz & Boone, 'Principles of Marketing', Cengage Learning
5. Kotler & Armstrong, 'Principles of Marketing', Prentice Hall
6. Biplab S. Bose, 'Marketing Management', Himalaya Publications
7. Subhash c. Jain, 'Marketing Management', Cengage Learning
8. Rajan Saxena, 'Marketing Management', Tata McGraw Hill.

**PROJECT MANAGEMENT**

**Subject Code: MBAD0- F95**

**L T P C  
3 0 0 3**

**Duration: 40 Hrs**

**Objective:** To acquaint the students with the steps involved in the planning, implementation and control of projects.

**UNIT-I (10 Hrs)**

Project Management Concepts Attributes of a Project, Project Life Cycle, The Project management Process, Benefits of Project Management, Needs Identification,

**UNIT-II (10 Hrs)**

Project Selection, preparing a Request for Proposal, Soliciting Proposals, Project organization, the project as part of the functional organization, pure project organization, the matrix organization, mixed organizational systems.

**UNIT-III (10 Hrs)**

Project Planning and Scheduling: Design of project management system; project work system; work breakdown structure, project execution plan, work packaging plan, project procedure manual; project scheduling; bar charts, line of balance (LOB) and Network Techniques (PERT/CPM)/GERT, Resource allocation, Crashing and Resource Sharing

**UNIT-IV (10 Hrs)**

Project Monitoring and Control and Project Performance: Planning, Monitoring and

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Control; Design of monitoring system, Coordination; Procedures, Meetings, Control; Scope/Progress control, Performance control, Schedule control, Cost control, Performance Indicators.

**Note: Relevant Case Studies should be discussed in class.**

**Recommended Books**

1. Kanda, 'Project Management – A Life Cycle Approach', PHI.
2. Gido, 'Project Management', Cengage Learnings.
3. Vasant Desai, 'Project Management' Himalaya Publications.
4. Maylor, 'Project Management', Pearson Education.
5. Prasanna Chandra, 'Projects, Preparation, Appraisal Budgeting & Implementation', Tata McGraw Hills.

**TEXTILE CHEMISTRY – I**

**Subject Code: MTEX0-F91**

**L T P C**  
**3 0 0 3**

**Contact Hrs.-40**

**UNIT-I (10 Hrs)**

**Introduction:** Process line for pretreatment, colouration and finishing of textiles

**Singeing:** Object of the process, types of singeing, details of various singeing methods, drawbacks and advantages. Process and quality control aspects involved.

**Desizing:** Object, types, method details and mechanism of removal of starch in various methods. Efficiency of desizing.

**Scouring:** Objectives, mechanism of removal of impurities, recipe and controlling parameters involved. Scouring of coloured textiles. Scouring of natural, man-made and blended textiles. Evaluation of scouring efficiency.

**UNIT-II (10 Hrs)**

**Bleaching:** Objectives of bleaching. Hypochlorite, peroxide, chlorite and peracetic acid bleaching methods and their effectiveness on various textiles. Controlling parameters and mechanism involved in each method. Efficiency of bleaching.

**Mercerization:** Objectives, mechanism related to various physical and chemical changes in cotton during mercerization. Process parameters and operation details. Causticization. Wet and hot mercerization. Ammonia treatment of cotton. Performance of various mercerization /alkali treatment processes. Assessment of efficiency of mercerization: Barium activity number, its determination and interpretation.

**Pretreatment machineries:** Singeing m/c, J-box, kier, mercerizing machine,

**UNIT-III (10 Hrs)**

**Heat setting:** Objectives and mechanism of setting. Different methods of heat setting and their effectiveness on various man made textiles and blends. Heat setting conditions and controls. Heat setting of polyester, nylon, acetate and their blends. Evaluation of degree of heat setting.

**Mechanical Finishes:** Physical and chemical softening processes, selection of chemical and evaluation of softening. Calendaring - its types, construction and function of various calendaring m/cs. Sanforizing - method, mechanism and machineries involved. Evaluation of sanforizing.

**UNIT-IV (10 Hrs)**

**Carbonization:** Objectives, selection of chemical, process details, trouble shoots, precautionary measures and efficiency of carbonization.

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**Functional finishes:** Problem of creasing, anti-crease finish on cotton. Choice of chemical, catalyst and process parameters. Drawback and advantages associated with use of various anti-crease chemicals. Measures to reduce release of formaldehyde. Water repellency and water repellent finishes on cotton. Evaluation of water repellency.

**Recommended Books:**

1. A.K. Roy Choudhary, 'Textile Preparation & Dyeing', Science Publishers USA, 2006.
2. R.H. Peters, 'Textile Chemistry', Vol - II, Elsevier Publishing Company, London, 1967.
3. R.M. Mittal and S.S., Trivedi, 'Chemical Processing of polyester / cellulosic Blends',  
4. Ahmedabad Textile Industries Research Association, Ahmedabad, India, 1983.
5. S.R. Karmakar, 'Chemical Technology in the Pretreatment Processes of Textiles', Textile  
6. Science & Technology Series, Vol-12, 1<sup>st</sup> Edn., Elsevier, 1999.
7. A.J. Hall, 'Textile Finishing', Haywood Books, London, 1996.
8. V.A. Shenai, 'Technology of Bleaching & Mercerization'.
9. Vaidya, 'Textiles Auxiliaries & Finishing Chemicals'.
10. V.A. Shenai and N.M., Saraf, 'Technology of Textile Finishing', Sevak Publications, Mumbai, 1990.

**COMPUTER APPLICATIONS IN BUSINESS**

**Subject Code: MCAP0-F91**

**L T P C**

**Contact Hrs.-40**

**3 0 0 3**

**Course Objectives:** The objective of this course is to provide an insight into basic features of computer systems and their applications in Managerial Decision Making. It also provides technical framework to students for understanding the emerging world of e-Business.

**UNIT-I (10 Hrs)**

**Introduction to Computers:** Types of Computers, Storage Devices and Memories, Input/Output devices. Introduction to Software, Types of software – Software: its nature and qualities.

Operating System: Types of Operating System, WINDOWS XP: Basic Operations, utilities and features.

**UNIT-II (10 Hrs)**

**MS Applications:** MS Word – Basics, formatting text and documents, Mail Merge, Macros  
MS Excel – Introduction, Creating a List, Graphs and Charts, Sorting, Filtering Data, Goal seek, Pivot tables, Freezing Panes, What-if Analysis, Splitting Windows, Basic Formulae in Excel.  
MS PowerPoint – Basics, Creating effective presentation, Animations and Templates.  
MS Access – Designing of Forms, Report generation using wizard.

**UNIT-III (10 Hrs)**

**Internet and E-Business:** Introduction to internet and its applications, Intranet and Extranet, World Wide Web, Internet, Architectures, Internet Applications. E – business - E-Business framework, Infrastructure for E-Business, E - Shopping, Electronic Data Interchange, Components of Electronic Data Interchange, Creating Web Pages using HTML, Electronic Payment System.

**UNIT-IV (10 Hrs)**

**Computer Networks and Security:** Overview of a Network, Types of Network, Network Topologies, Firewall, Encryption v/s Decryption, Cryptography, Public Key and Private Key, Digital Signatures.

**Course Outcomes:** Students will be able to understand the concepts of computer and various software related to it. The use of MS Office (Excel, Access & Power point) helps in different

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type of analysis and projection of reports related to the business management. The software helps in planning & coordinating the supply chain of the company.

**Recommended Books:**

1. Rainer and Potter, 'Introduction to Information Technology', John Wiley and Sons.
2. Roger Jennings, 'Microsoft Access 2010', Pearson Education.
3. Forouzan, 'Basics of Computer Science', Cengage Learning.
4. Joseph Brady & Ellen F Monk, 'Problem Solving Cases in Microsoft, Excel Thomson Learning'.
5. K. Saini & Pradeep Kumar, 'Computer Applications in Management', Anmol Publications.
6. Deepak Bharihoke, 'Fundamentals of Information Technology', Excel Books.

**PHYSICS OF MATERIALS**

**Subject Code: MPHY0-F91**

**LT P C**  
**3 0 0 3**

**Contact Hrs.-48**

**UNIT-1 (12 Hrs)**

**Polymer Materials**

Polymer Structure: Molecular Weight, Shape, Structure and Configuration; Thermoplastic and Thermosetting, Mechanical Behavior of Polymers-stress strain behavior, Macroscopic and Viscoelastic deformation, Fracture of polymers, Mechanical Characteristics-Fatigue, Tear Strength and Hardness, Mechanisms of Deformation and strengthening of polymers. Crystallization, Melting and Glass Transition Phenomena in Polymers.

**UNIT-II (12 Hrs)**

**Composite Materials**

Introduction, Particle-Reinforced Composites-Large, Fiber-Reinforced Composites: Influence of Fiber Length, Influence of Fiber Orientation and Concentration, The Fiber Phase, The Matrix Phase, Polymer-Matrix Composites, Metal-Matrix Composites, Ceramic-Matrix Composites.

**UNIT-III (11 Hrs)**

**Nano-Materials**

Emergence of Nanotechnology, Micro to Nanoscale materials, Characteristics of Nanomaterials-Band gap, surface to volume ratio, Electron confinement for zero, one and two dimensional nanostructures, synthesis of nanomaterials with top down and bottom up approach, Methods of Synthesis- ball milling, sol-gel, Electro-spinning and Lithography techniques, Carbon nanotubes (synthesis and properties), applications of nanomaterials.

**UNIT-IV (13 Hrs)**

**Electrical, Magnetic and Thermal Properties of Materials**

Electrical properties of materials: Conduction in ionic materials, Dielectric behavior, Field vectors and polarization types, Frequency dependent dielectric constant, Other Electrical characteristics of materials and its applications: Ferroelectricity, Piezoelectricity.

Magnetic Properties of Materials: Magnetic materials and its classifications, Domain and Magnetic Hysteresis, Magnetic storage, Magnetic Anisotropy, Soft and Hard magnetic materials.

Thermal properties of materials: Heat capacity, Thermal expansion, Thermal conductivity and Thermal stresses.

**Recommended Books:**

1. William D. Callister, 'Materials Science and Engineering: An Introduction', 4<sup>th</sup> Edn., John

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Wiley & Sons, Inc.

2. G.M. Chow & K.E. Gonsalves, 'Nanotechnology - Molecularly Designed Materials', 2<sup>nd</sup> Edn, American Chemical Society
3. K.P Jain, 'Physics of Semiconductor Nanostructures', Narosa Publishing House, 1997.
4. G. Cao, 'Nanostructures and Nanomaterials: Synthesis, Properties and Applications', Imperial College Press, 2004.

**STATISTICAL METHODS**

**Subject Code: MMAT0-F91**

**L T P C  
3 0 0 3**

**Contact Hrs.-36**

**UNIT-I (12 Hrs.)**

**Statistics:**

Introduction, Importance and Scope of Statistics, Mean, Median, Mode, Mean Deviation and Standard Deviation.

**Correlation and Regression:**

Correlation: Introduction, Types of Correlation, Measurement of Correlation: Karl Pearson's Coefficient of Correlation, Spearman's Rank Correlation

Regression: Introduction, Utility, Method of Least Squares, Coefficient of Regression, Coefficient of Determination.

**UNIT -II (12 Hrs.)**

**Random Variables:**

Definition, Probability distribution, Distribution functions, probability distribution function (pdf) and cumulative distribution function (cdf), Expectation and Variance.

**UNIT -III (7 Hrs.)**

**Theory of Probability:**

Additive and multiplicative law of probability, conditional probability and Bayes theorem.

**Probability distributions:**

Binomial, Poisson, Normal Distribution

**UNIT -IV (5 Hrs.)**

**Sampling Distribution:**

Concept of sampling distribution and its standard error, Tests of significance: Tests based on Normal Distribution, Chi-square, t and F statistic.

**Recommended Books:**

1. H. Morris, DeGroot and J. Mark Schervish, 'Probability and Statistics', Pearson Education; 4<sup>th</sup> Edn.
2. Vijay K. Rohatgi, A.K. Md. Ehsanes Saleh, 'An Introduction to Probability and Statistics', 2<sup>nd</sup> Edn., Wiley,
3. Jay L. Devore, 'Probability and Statistics for Engineering and the Sciences', Cengage', 8<sup>th</sup> Edn'.
4. S.C. Kapoor, V.K. Gupta, 'Fundamentals of Mathematical Statistics', 11<sup>th</sup> Edn., S. Chand,

**INDUSTRIAL SAFETY AND ENVIRONMENT**

**Subject Code: MMEE0-F91**

**L T P C  
3 0 0 3**

**Contact Hrs.-45**

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**UNIT-I (9 Hrs)**

**Meaning & need for safety.** Relationship of safety with plant design, equipment design and work environment. Industrial accidents, their nature, types and causes. Assessment of accident costs; prevention of accidents. Industrial hazards, Hazard identification techniques, Accident investigation, reporting and analysis.

**UNIT-II (11 Hrs)**

**Planning for safety & its Measures:** Definition, purpose, nature, scope and procedure. Range of planning, variety of plans. Policy formulation and implementation of safety policies. Safety measures in a manufacturing organization, safety and economics, safety and productivity. Employees participation in safety. Safety standards and legislation.

**UNIT-III (11 Hrs)**

**Meaning of environment and need for environmental control:** Environmental factors in industry. Effect of temperature, Illumination, humidity noise and vibrations on human body and mind. Measurement and mitigation of physical and mental "fatigue" Basics of environment design for improved efficiency and accuracy at work. Environment Standards: Introduction to ISO 14000; Environment standards for representative industries.

**UNIT-IV (14 Hrs)**

**Ventilation and heat Control Purpose of ventilation, Lighting, Noise & Vibrations.** Physiology of heat regulation. Thermal environment and its measurement. Thermal comfort. Indices of heat stress. Thermal limits for comfort, efficiency and freedom from health risk. Natural ventilation. Mechanical ventilation. Air conditioning Process ventilation. Control of heat exposures: control at source, insulation, and local exhaust ventilation. Control of radiant heat, dilution ventilation. Local relief. Industrial Lighting: Purpose of lighting, benefits of good illumination. Phenomenon of lighting and safety. Lighting and the work. Sources and types of artificial lighting. Principles of good illumination. Recommended optimum standards of illumination. Design of lighting installation. Maintenance standards relating to lighting and colour. Noise & Vibrations: Continuous and impulse noise. The effect of noise on man. Noise measurement and evaluation of noise. Noise isolation. Noise absorption techniques. Silencers vibrations: Effect, measurement and control measures.

**Recommended Books:**

1. H.W. Heinrich, 'Industrial Accident Prevention,' McGraw Hill.
2. Joselin, Edward Arnold, 'Ventilation'.
3. Beranek, 'Noise Reduction', McGraw Hill.
4. D.C. Reamer, 'Modern Safety and health Technology,' R. Wiley.
5. Firenze, R.J. Kendale, 'The Process of Hazard Control.'

**SUPPLY CHAIN MANAGEMENT**

**Course Code: MMEE0-F92**

**L T P C  
3 0 0 3**

**Contact Hrs. 42**

**Unit-I (10 Hrs)**

**Understanding the Supply Chain:** Process view, Decision phases and importance of supply chain, Supply chain management and logistics, supply chain and the value chain, Competitive advantage, supply chain and competitive performance, changing competitive environment, Supply Chain drivers and obstacle.

**Unit-II (12 Hrs)**



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**Matching supply and demand:** The lead-time gap, Improving the visibility of demand, supply chain fulcrum, forecast for capacity, execute against demand, Demand management and aggregate planning, Collaborative planning, forecasting and replenishment.

**Creating the responsive supply chain:** Product 'push' versus demand 'pull' The Japanese philosophy, Foundations of agility, Route map to responsiveness.

**Strategic lead-time management:** Time-based competition, Lead-time concepts, Logistics pipeline management.

**Unit-III (10 Hrs)**

**Planning and managing inventories in a supply chain:** managing economies of scale in supply chain cycle inventory, managing uncertainty in supply chain, determining optimal level of product availability.

**Transportation, Network Design and Information Technology in a supply chain:** transportation, facility design network design in a supply chain, extended enterprise and the virtual supply chain, role of information and information technology in the supply chain, Laying the foundations for synchronization, 'Quick response' logistics, Production strategies for quick response, Logistics systems dynamics.

**Unit-IV (10 Hrs)**

**Managing risk in the supply chain:** Vulnerability in supply chains, Understanding the supply chain risk profile, managing supply chain risk, Achieving supply chain resilience.

**Overcoming the barriers to supply chain integration:** Creating the logistics vision, Problems with conventional organizations, Developing the logistics organization, Logistics as the vehicle for change, Benchmarking.

**Recommended Books:**

1. S. Chopra, and P. Meindl, 'Supply Chain Management', Prentice Hall, 2010.
2. M. Christopher, 'Logistics & Supply Chain Management', FT Prentice Hall, 2011.
3. John T. Mentzer, J. T., 'Supply Chain Management', Illustrated Edn., SAGE Publications, 2001.
4. Michael Hugos, M.H., 'Essentials of Supply Chain Management', John Wiley, 2011.
5. D. Simchi-Levi, P. Kaminsky, E. Simchi-Levi, 'Designing and Managing the Supply Chain', McGraw Hill Higher Education, 2011.

**ENVIRONMENT MANAGEMENT**

**Subject Code: MCIE0-F91**

**L T P C  
3 0 0 3**

**Duration – 45 Hrs**

**UNIT-I (12 Hrs)**

Global Environmental Problems: Global warming, green-house effect, ozone depletion, acid rain, oil pollution, radiation hazard and control, global climate change. Main clauses and basic steps for Environmental Management System certification. Environmental Laws/Acts.

**UNIT-II (10 Hrs)**

Cleaner Production Technologies Need and benefits, cleaner production techniques and options, zero impact manufacturing initiatives CDM and carbon credits/case studies.

**UNIT-III-(11 Hrs)**

Environment Impact Assessment: Definition and its importance for environment management, constituents of environment impact assessment, project data for EIA study, prediction of impacts,

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EIA methodologies, constraints in implementation of EIA, impact prediction on water resources projects and other relevant case studies. Environment pollution.

**UNIT IV (12 Hrs)**

Degradation of Land Resources: Deforestation: Forest land, deforestation and its effects on land use and Environmental quality, wetland and their importance in environment, causes and extent of wasteland, Soil degradation problems, erosion, salinization, water logging, land use management & planning.

**Recommended Books:**

1. Peavy, Rowe, 'Techobanoglous, Environmental Engg.', Tata McGraw-Hill.
2. Mackenzie L. Davis, 'Environmental Engg.', Tata McGraw-Hill.
3. Baljeet S. Kapoor, 'Environmental Engg. An overview', Khanna Publishers.
4. Gilbert H. Masters, 'Environmental Engineering and Science', Prentice Hall of India Pvt. Ltd.
5. G.N. Panday, G.C. Carney, 'Environmental Engineering', Tata McGraw-Hill.
6. P.D. Sharma, 'Ecology and Environment', Rastogi Publications.
7. P.A. Ray, 'Lcances Environmental Impact Assessment', Hand National Environmental Protection Council, Manile.

**OILS AND FATS**

**Subject Code: MCHM0-F91**

**L T P C**

**Contact Hrs.**

**Unit-I (10 Hrs.)**

**Lipids:** Classification, role of lipids, synthesis of fatty acids. Introduction to edible oils, Methods of extracting vegetable oils, Edible oil, chemistry of edible fats; vegetable-oil separation technology; and water- and heat-promoted fat separation from animal and plant "fatty tissues". Differences between vegetable and mineral oil

**Unit-II (10 Hrs.)**

Rancidity, reversion, polymerization, saponification, refining process; the fat-modification processes(Hydrogenation), addition, phospholipids, lipid metabolism; intermediary metabolism of fatty acids, Physical properties - polymorphism, reactions of fats.

**Unit-III (10 Hrs.)**

Estimation of oil in oil seeds, Estimation of free fatty acids, Saponification value of oils, Identification and quantification of fatty acids. The technologies applied to specialty fats; the storage and transport of oils and fats; and energy demands of the oil-milling and edible-fat processing operations.

**Unit-IV (10 Hrs.)**

**Analysis of Oils and Fats:** Softening point, Congent point, Titre point, cloud point, Iodine, Saponification, acid, hydroxyl, R-M and Polenske value, peroxide value of oil, Elaiden test.

**Books Recommended:**

1. M. Kolthoff, 'Treatise on Analytical Chemistry', Vol. I and I 4.
2. D. Pearson, 'Laboratory Techniques in Food Analysis'.
3. S. Ranganna, 'Handbook of Analysis and Quality Control for Fruits and Vegetable Products, 2<sup>nd</sup> Edn., McGraw Hill.
4. Nicholls, 'Aids to the analysis of Foods and Drugs'.
5. Karamer Twig, 'Quality Control for Food Industry', (AVI) 9.

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6. C.B. Catodo, R.R. Sharon and N.W. Eleanor, 'Understanding Clinical Nutrition', Second Edn., Belmont CA: West/ Wadsworth-An International Thomson Publishing Company, 1988.
7. R. Passmore, M.A. Eastwood, 'Human Nutrition and Dietetics', Edinburgh: Churchill Livingstone, 1990.
8. H. Robinson Corinne, R.L. Marilyn, Wanda La and E.G. Ann, '1990 Normal and Therapeutic Nutrition', 17<sup>th</sup> Edn., Scotland: Macmillan Publishing.
9. M. Swaminathan, 'Food Science, Chemistry and Experimental Foods'.
10. G.F.F.J. Welcher, 'Standard Methods of Chemical Analysis', Vol I & II, 6<sup>th</sup> Edn.
11. S.N. Mahendru, 'Analysis of Food Products', Swan Publishers.
12. C.B. Catodo, R.R. Sharon and N.W. Eleanor, 'Understanding Clinical Nutrition', 2<sup>nd</sup> Edn., 1988.

**COMPUTER NETWORKS**

**Subject Code: MECE0-F91**

**L T P C  
3 0 0 3**

**Duration: 48 Hrs**

**Course Objectives**

This course provides an In-depth knowledge on computer networks and provides a good background for advanced studies in communication networks.

**Learning Outcomes:**

The students will be able to design different networks based on different Internet protocols and also able to work for different OSI layers.

**Unit 1 (12 hrs)**

**Introduction and Overview:** The need of Internet, TCP/IP Internet, Internet services, History & scope, Protocol standardization.

**Review of Underlying Technologies:** LAN, WAN, MAN, Ethernet Topology, Token Ring, ARPANET, PRO net technology, FDDI. Internetworking concepts and architectural model, application level Internet connection, Interconnection through IP gateway, users view.

**Unit II (12 hrs)**

**Internet Addresses:** Universal Identifiers, Three Primary Classes of IP Addresses, Structure of IP packets, network and broadcast addresses, class less addressing, supernet/ subnet addressing, Addressing Conventions, Mapping Internet Addresses to Physical Addresses (ARP/RARP), Determining Internet Addresses at Startup (DHCP, Bootp).

**Unit III (12 hrs)**

**Internetworking:** Internet as a virtual network, Internetworking devices (routers, bridges, gateways), Protocol layering, routing algorithms, congestion control techniques, ICMP, IP Fragmentation, difference between X.25 and Internet layering, Gateway to Gateway Protocol (GGP), OSPF, Exterior Gateway Protocol (EGP), Managing Internet.

**Unit IV (12 hrs)**

**Security Issues:** Reliable Transactions and Security on Internet, Data encryption, IPsec, SSL, Concept of Firewalls, Intrusion Detection Systems, Denial of Service Attacks.

**Recommended Books:**

1. Comer, 'Internetworking with TCP/IP', vol-1, PHI.

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2. Stevan, 'TCP/IP Illustrated', Pearson.
3. Forouzan 'TCP/IP Suite', TMH.
4. Related IEEE/IEE Publications.

**DIGITAL SIGNAL PROCESSING**

**Subject Code: MECE0-F92**

**L T P C  
3 0 0 3**

**Duration: 48 Hrs**

**UNIT I (12 hrs)**

Introduction to DSP, Time and Frequency domain description of different type of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems.

**UNIT II (12 hrs)**

Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, Sampling of continuous time signal, Reconstruction of continuous time signal from sequences, Z-Transform and its properties, complex Z-plane, ROC. Relationship between Fourier Transform and Z-Transform, Inverse Z-Transform.

**UNIT III (12 hrs)**

Discrete Time Fourier Transform and its properties, Linear convolution, Circular convolution, convolution from DFT, FFT, Inverse Fast Fourier Transform, Decimation in time and frequency algorithm.

**UNIT IV (12 hrs)**

Filter categories, Finite impulse response filters, various design techniques of FIR filters, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window, Kaiser window. Design of IIR by Approximation of derivatives, Impulse invariant method and Bilinear Transformation method. Steps in Filter Design of Butter worth, Elliptic filter, Chebyshev filters, Frequency Transformation, Applications of DSP. Introduction to DSP Processor.

**Recommended Books**

1. Oppenheim & Scheffer, 'Discrete Time Processing', PHI.
2. Proakis & D.G. Monolakis, 'Digital Signal Processing', PHI.
3. S.K. Mitra, 'Digital Signal Processing', PHI.
4. Roman Kuc, MC, 'Digital Signal Processing', MGH Pub.
5. E.C. Ifeachor, B.W. Jervis, 'Digital Signal Processing', Addison Wesley.

**SENSORS AND TRANSDUCERS**

**Subject Code: MECE0-F93**

**L T P C  
3 0 0 3**

**Duration: 48 Hrs**

**Course Objectives:**

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The main aim of this course is to understand the role of sensors and transducers for different communication systems. In this different transducers for Temperature, pressure, Liquid level measurement will be discussed in detail.

**Learning Outcomes:**

For different process control industries sensors and transducers play a vital role. For DCS, SCADA or PLC operation basic idea about measurement will be boosted in the students.

**UNIT-I (12 Hrs)**

**Sensors/Transducers:** Principles, Classification, Parameters, Characteristics (Static and Dynamic), Environmental Parameters (EP), Characterization.

**Mechanical and Electromechanical Sensors:** Introduction, Resistive Potentiometer, Strain Gauge (Resistance and Semiconductor), Inductive Sensors: Sensitivity and Linearity of the Sensor, Types-Capacitive Sensors, Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors.

**UNIT –II (12 Hrs)**

**Thermal Sensors:** Introduction, Gas Thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor, Dielectric Constant and Refractive Index Thermosensors, Helium Low Temperature Thermometer, Nuclear Thermometer, Magnetic Thermometer, Resistance Change Type Thermometric Sensors, Thermo-emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry and Heat Flux Sensors.

**Magnetic Sensors:** Introduction, Sensors and the Principles Behind, Magnetoresistive Sensors (Anisotropic and Semiconductor), Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers (Synchros and Synchro-resolvers), Eddy Current Sensors, Electromagnetic Flowmeter, Switching Magnetic Sensors and SQUID Sensors.

**UNIT-III (12 Hrs)**

**Radiation Sensors:** Introduction, Basic Characteristics, Types of Photosensistors/Photodetectors, X-ray and Nuclear Radiation Sensors and Fibre Optic Sensors.

**Electroanalytical Sensors:** Introduction, The Electrochemical Cell, The Cell Potential, Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization (Concentration, Reactive, Adsorption and Charge Transfer), Reference Electrodes, Sensor Electrodes and Electroceramics in Gas Media.

**UNIT-IV (12 Hrs)**

**Smart Sensors:** Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing, Data Communication (Standards for Smart Sensor Interface) and The Automation

**Sensors Applications:** Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing and Sensors for Environmental Monitoring.

**Recommended Books**

1. D. Patranabis, 'Sensors and Transducers', 2<sup>nd</sup>Edn., PHI, 2003.
2. W. Bolton, 'Mechatronics', 4<sup>th</sup> Edn., Pearson, 2011.

**ELECTRONIC SYSTEM DESIGN**

**Subject Code: MECE0-F94**

**L T P C**

**Duration: 48 Hrs**

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**3 0 0 3**

**UNIT-I (12 Hrs)**

**MSI and LSI Circuits and Their Applications:** Review of Digital electronics concept, Arithmetic Circuits, Comparators, Multiplexers, Code Converters, XOR and AND OR INVERTER Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System, Propagation Delay.

**UNIT-II (12 Hrs)**

**Sequential Machines:** The Concept of Memory, The Binary Cell, The Cell and The Bouncing Switch, Set/Reset, D, Clocked T, Clocked JK Flip Flop, Design of Clock F/F, Conversion, Clocking Aspects, Clock Skew, State Diagram Synchronous Analysis Process, Design Steps for Traditional Synchronous Sequential Circuits, State Reduction, Design Steps For Next State Decoders, Design of Out Put Decoders, Counters, Shift Registers and Memory.

**UNIT-III (12 Hrs)**

**Multi Input System Controller Design:** System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design.

**UNIT-IV (12 Hrs)**

**Asynchronous Finite State Machines:** Scope, Asynchronous Analysis, Design of Asynchronous Machines, Cycle and Races, Plotting and Reading the Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches to Asynchronous Design, Hazards in Circuit Developed by MEV Method, Electromagnetic Interference and Electromagnetic Compatibility Grounding and Shielding of Digital Circuits. Interfacing digital system with different media like fibre cable, co-axial cable etc.

**Recommended Books:**

1. Fletcher, 'An Engineering Approach to Digital Design', PHI, 1990.
2. 'Designing with TTL Circuits', Texas Instruments.
3. Related IEEE/IEE Publications.

**DIGITAL CIRCUITS AND LOGIC DESIGN**

**Subject Code: MECE0-F95**

**L T P C**

**Duration: 48 Hrs**

**3 0 0 3**

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**Course Objectives**

The use of digital circuitry is present in virtually all aspects of our lives and its use is increasing rapidly. Thus, this course aims to introduce postulates of Boolean algebra; methods for simplifying Boolean expressions and also outline the formal procedures for the analysis and design of combinational and sequential circuits. Next focus is to get student familiarize with concepts of digital logic families, D/A & A/D converters, memories and programmable logic devices.

**Course Outcomes:**

After going through this subject in detail student will be able to understand Digital devices and in turn can learn and operate Microprocessor/Microcontroller more easily.

**UNIT I (12 Hrs)**

Fundamentals of Digital Techniques: Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

**UNIT II (12 Hrs)**

Combinational Design Using Gates: Design using gates, Karnaugh map and Quine Mcluskey methods of simplification. Combinational Design Using MSI Devices: Multiplexers and Demultiplexers and their use as logic elements, Decoders, Adders / Subtractors, BCD arithmetic circuits, Encoders, Decoders / Drivers for display devices.

**UNIT III (12 Hrs)**

Sequential Circuits: Flip Flops: S-R, J-K, T, D, master-slave, edge triggered, shift registers, sequence generators, Counters, Asynchronous and Synchronous Ring counters and Johnson Counter, Design of Synchronous and Asynchronous sequential circuits.  
Digital Logic Families: Switching mode operation of p-n junction, bipolar and MOS. devices. Bipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families.

**UNIT IV (12 Hrs)**

A/D and D/A converters: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel - comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs. Programmable Logic Devices: ROM, PLA, PAL, FPGA and CPLDs. Finite State Machines: Finite state model, Memory elements and their excitation functions, Synthesis of Synchronous sequential circuits, Capabilities and limitations of FSM, Design, Modelling and Simulation of Moore and Mealy machines.

**Recommended Books:**

1. R.P. Jain, 'Modern Digital Electronics', 3<sup>rd</sup>Edn., TMH.
2. R.P. Jain, 'Modern Digital Electronics', 4<sup>th</sup>Edn., TMH, 2011.
3. Malvino & Leach, 'Digital Principals & Applications', 4<sup>th</sup>Edn., TMH, 1991.
4. Fletcher, 'An Engg. Approach to Digital Design', Indian Edn., PHI, 2011.
5. Digital Electronics by Sanjay Sharma', S.K. Kataria & Sons, 1<sup>st</sup>Edn., 2011.