

**MRSPTU POST GRADUATE OPEN ELECTIVES-II 2016 BATCH ONWARDS  
(UPDATED ON 26.7.2017)**

<b>PG OPEN ELECTIVES-II 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-II 2016 BATCH ONWARDS</b>		
<b>COURSE CODE</b>	<b>COURSE</b>	<b>NOT APPLICABLE FOR PROGRAMMES</b>
MITE0-F92	Network Security and Ethical Hacking	M.Tech. IT, M.Tech. IT & CW, M.Sc. IT
MCSE0-F95	Advanced Operating Systems	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-F96	Enterprise Resource Management	
MCSE0-F97	Advanced Computer Networks	
MCSE0-F98	Digital Image processing	
MCSE0-F99	Database Management Systems	
MBAD0-F96	Accounting & Financial Management	M.B.A.
MBAD0-F97	Business Ethics	
MBAD0-F98	EEIM	
MBAD0-F99	Basic Accounting	
MCHM0-F92	Dyes, Soaps and Detergents	M.Sc. Chemistry
MMEE0-F93	Advanced Power Plant Engineering	ME (Automation & Robotics), M.Tech. ME (CAD/CAM), M.Tech. ME (Industrial & Production), M.Tech. ME (Production), M.Tech. ME (Thermal Engg.)
MPHY0-F92	Science of Renewable Energy Resources	M.Sc. Physics
MECE0-F96	Fundamentals of Electronic Communications	M.Tech. Electronics & Instrumentation, M.Tech. ECE (Microelectronics), M.Tech. ECE (Embedded System), M.Tech. ECE (Signal Processing)
MECE0-F97	Electronic Instrumentation	
MECE0-F98	Reliability Engineering	
MECE0-F99	Linear Control Systems	
MMAT0-F92	Ordinary Differential Equations	
MMAT0-F93	Numerical Methods	
MELE0-F95	Advanced Transducer Technology	M.Tech. Electrical Engg., M.Tech. EE (Power System), M.Tech. EE (Instrumentation & Control Engg.)
MELE0-F96	Electric Traction System	
MELE0-F97	Power Electronic Devices & Controllers	
MBAD0-FX1	Intellectual Property Rights	---
MMAT0-F95	Operation Research and Statistics	---

**NETWORK SECURITY AND ETHICAL HACKING**

Course Code: MITE0-F92

L T P C

3 0 0 3

**Introduction**

Network Security, Functionality and ease of use Triangle, Essential Terminology and Elements of Security (Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit), Concept of ethical hacking Phases involved in hacking, Penetration Testing and Ethical Hacking

**Foot Printing**

Introduction to foot printing, Information gathering methodology of the hackers, Active and passive reconnaissance

**Scanning**

Scanning, Elaboration phase, active scanning. Enumeration, DNS Zone transfer. Detecting live systems on the target network, discovering services running /listening on target systems, understanding port scanning techniques, Identifying TCP and UDP services running on the target network, Understanding active and passive fingerprinting

**System Hacking**

Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Key (stroke) Loggers, Understanding Sniffers and their working, Comprehending Active and Passive Sniffing, Man-in-the-Middle Attacks, ARP Spoofing/Poisoning and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

**Trojans and Backdoors**

Trojan, Overt and Covert Channels, Working of Trojans, Different Types of Trojans, Different ways of Trojan's entry into a system, Indications of a Trojan Attack

**Session Hijacking**

Understanding Session Hijacking, spoofing vs. hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session hijacking Tools.

**Hacking Wireless Networks**

Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

**Recommended Books:**

1. Rajat Khare, 'Network Security and Ethical Hacking', Luniver Press, 2006.
2. Thomas Mathew, 'Ethical Hacking', OSB Publisher, 2003.
3. Stuart McClure, Joel Scambray and George Kurtz, 'Hacking Exposed: Network Security Secrets & Solutions', McGraw-Hill, 2005.
4. 'Ethical Hacking and Network Defense', Cengage Course, 2009.
5. Eric Core, 'Hackers Beware', EC-Council Press, 2003.

**ADVANCED OPERATING SYSTEM**

**Subject Code-MCSE0-F95**

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

**Duration – 45 Hrs.**

**COURSE OBJECTIVES:**

To learn the fundamentals of Operating Systems and gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols

**COURSE OUTCOMES:**

CO1 Discuss the various synchronization, scheduling and memory management issues

CO2 Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system

CO3 Discuss the various resource management techniques for distributed systems

CO4 Identify the different features of real time and mobile operating systems

**UNIT-I (11 Hrs.)**

**Fundamentals of Operating Systems:** Strategies of operating system, Structures of operating system, overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling –Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

**Distributed Operating Systems:** Issues in Distributed Operating System – Architecture – Communication Primitives – Lamport’s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

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

**Distributed Resource Management:** Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Non blocking Commit Protocol – Security and Protection.

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

**Real Time And Mobile Operating Systems:** Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems –Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads – Memory Management – File system, Networked file system

**UNIT-IV (11 Hrs.)**

**Case Studies:** Linux System: Design Principles - Kernel Modules - Process Management Scheduling –Memory Management - Input-Output Management - File System – Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer -Services Layer - Core OS Layer – File System.

**RECOMMENDED BOOKS**

1. Andrew S. Tanenbaum and Maarten van Steen, ‘Distributed Systems: Principles and Paradigms’, 2<sup>nd</sup> Edn., Prentice Hall, **2007**.
2. Mukesh Singhal and Niranjana G. Shivaratri, ‘Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems’, Tata McGraw Hill, **2001**.

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3. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, 'Operating System Concepts', 7<sup>th</sup> Edn., John Wiley & Sons, **2004**.
4. Daniel P. Bovet and Marco Cesati, 'Understanding the Linux kernel', 3<sup>rd</sup> Edn., O'Reilly, **2005**.
5. Rajib Mall, 'Real-Time Systems: Theory and Practice', Pearson Education India, **2006**.
6. Neil Smyth, 'iPhone iOS 4 Development Essentials – Xcode', 4<sup>th</sup> Edn., Payload media, **2011**.

**ENTERPRISE RESOURCE PLANNING**

**Course Code: MCSE0-F96**

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

**Contact Hrs. 45**

**COURSE OBJECTIVES**

This course will explore the concepts, principles, and state-of-the-art methods in successfully integrating Enterprise Resource Planning (ERP) systems into extant enterprise architectures. The course will help both functional area and IT managers understand the respective role of users, enterprise architects, developers and managers in the selection, preparation, implementation and management of large and complex enterprise applications

**COURSE OUTCOMES**

**CO1** Understand and gain insight into process views of organizations and tools and techniques used to model both as-is and to-be models.

**CO2** Know and be able to apply key technical terminology in enterprise information systems as they apply in different ERP products and development methods

**CO3** to understand various actions and business modules in ERP

**CO4** to understand market and various applications of ERP systems

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

**ERP AND TECHNOLOGY:** Introduction, Related Technologies, Business Intelligence, E-Commerce and E-Business, Business Process Reengineering, Data Warehousing, Data Mining, OLAP, Product life Cycle management, SCM, CRM

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

**ERP IMPLEMENTATION:** Implementation Challenges, Strategies, Life Cycle, Pre-implementation Tasks, Requirements Definition, Methodologies, Package selection, Project Teams, Process Definitions, Vendors and Consultants, Data Migration, Project management, Post Implementation Activities.

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

**ERP IN ACTION & BUSINESS MODULES:** Operation and Maintenance, Performance, Maximizing the ERP System, Business Modules, Finance, Manufacturing, Human Resources, Plant maintenance, Materials Management, Quality management, Marketing, Sales, Distribution and service.

**UNIT-IV(11Hrs.)**

**ERP MARKET:** Marketplace, Dynamics, SAP AG, Oracle, PeopleSoft, JD Edwards, QAD Inc, SSA Global, Lawson Software, Epicor, Intuitive.

**ERP Application:** Enterprise Application Integration, ERP and E-Business, ERP II, Total quality management, Future Directions, Trends in ERP.

**RECOMMENDED BOOKS**

1. Alexis Leon, 'ERP DEMYSTIFIED', Tata McGraw Hill, 2nd Ed, **2008**.
2. Mary Sumner, 'Enterprise Resource Planning', Pearson Education, **2007**.
3. Jim Mazzullo, 'SAP R/3 for Everyone', Pearson, **2007**.

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4. Jose Antonio Fernandez, 'The SAP R /3 Handbook', Tata McGraw Hill, **1998**.
5. Biao Fu, 'SAP BW: A Step-by-Step Guide', 1<sup>st</sup> Ed, Pearson Education, **2003**.

**ADVANCED COMPUTER NETWORKS**

**Subject Code-MCSE0-F97**

**L T P C**

**Duration – 45 Hrs.**

**3 0 0 3**

**COURSE OBJECTIVES:**

This course provides knowledge about computer network related hardware and software using a layered architecture. It is also offer good understanding of the concepts of network security, wireless, Adhoc and various emerging network technologies.

**COURSE OUTCOMES:**

CO1: Able to explain the Fundamentals of Computer Networks and their layered architecture. Also acquire knowledge about ATM Layered model and LAN Emulation.

CO2: Able to explain about various Transport and Application Layer Protocols. Also acquire knowledge about various congestion control mechanisms and network management.

CO3: Able to explain Features, advantages and applications of Adhoc Networks, Adhoc versus Cellular networks, Network architecture and Technologies. Evolution with the examples of wireless communication systems other techniques of Cellular Networks like 2G, 2.5G and 3G Technologies. Also able to explain wireless local loop (WLL), Wireless and local Area Networks (WLANs).

CO4: Able to define the Fundamentals of network security, various authentication protocols and E-mail Security.

**UNIT-I (11 Hrs.)**

Computer networks and layered architecture, Asynchronous Transfer Mode- ATM layered model, switching and switching fabrics, network layer in ATM, QOS, LAN emulation.

**UNIT-II (11 Hrs.)**

Transport Layer-Elements of transport protocols; Internet transport protocols: TCP and UDP, TCP connection management, congestion control. Application Layer-Network application architectures: Client-server, P2P and hybrid; Application layer protocols: DNS, FTP, TFTP, TELNET, HTTP and WWW, SMTP and electronic mail; Network management and SNMP.

**UNIT-III (13 Hrs.)**

**Adhoc and Cellular networks-** Features, advantages and applications, Adhoc versus Cellular networks, Network architecture, Protocols: MAC protocols, Routing protocols, Technologies. Wireless Communication Systems- Evolution, examples of wireless communication systems, 2G Cellular networks, Evolution for 2.5G TDMA Standards, IS-95B for 2.5G CDMA. Wireless and Mobile Networks-Wireless links and network characteristics, wireless local loop (WLL), Local Multipoint Distribution System (LMDS), Wireless local Area Networks (WLANs), Bluetooth and Personal Area Networks.

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

**Introduction to Network Security-** Cryptography, symmetric and public-key algorithms, digital signatures, communication security, and authentication protocols, E-mail security, PGP and PEM.

**RECOMMENDED BOOKS**

1. B.A. Forouzan, 'Data Communication and Networking', 5<sup>th</sup> Edn., Tata McGraw Hill, **2013**.
2. A.S. Tanenbaum, 'Computer Networks', 4<sup>th</sup> Edn., Pearson Education, **2002**.



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3. William Stallings, 'Network Security and Cryptography', 6<sup>th</sup> Edn., Prentice Hall of India, 2013.
4. Theodore S. Rappaport, 'Wireless Communication: Principles and Practices', 2<sup>nd</sup> Edn., Pearson Education, 2001.
5. D.E. Comer and R.E. Droms, 'Computer Networks and Internets', Prentice Hall, 4<sup>th</sup> Edn., 1998.
6. Sunil Kumar S. Manvi, Mahabaleshwar S. Kakkasageri, 'Wireless and Mobile Networks: Concepts and Protocols', 2<sup>nd</sup> Edn., Wiley India, 2016.

**DIGITAL IMAGE PROCESSING**

**Course Code: MCSE0-F98**

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

**Contact Hrs. 45**

**COURSE OBJECTIVES:**

Visual information plays an important role in many aspects of our life. Much of this information is represented by digital images. Digital image processing is ubiquitous, with applications including television, tomography, photography, printing, robot perception, and remote sensing. This is an introductory course to the fundamentals of digital image processing. It emphasizes general principles of image processing, rather than specific applications.

**COURSE OUTCOMES:**

CO1: To introduce the digital images, processing with digital images, application areas of the field, fundamentals step to process images, image acquisition and digitization and understand image processing system.

CO2: To learn basic image transforms, image enhancement in spatial as well as frequency domain, to make them aware about various filters used for enhancement. Aim is to introduce histograms in image processing.

CO3: To study the image restoration of degraded images and processing of colour images and Introduction to wavelets.

CO4: To understand the image compression in order to save bandwidth and storage, image segmentation techniques, representation of image and basics of morphological processing operations.

**UNIT-I (11 Hrs.)**

**Introduction:** Digital Images and their Representation, Digital image processing, Application areas of digital image processing. Fundamental Steps in Image Processing, Elements of a Digital Image Processing System.

**Digital Image Fundamentals:** Elements of Visual Perception, A Simple Image Model, Image acquisition, Sampling and Quantization, Some Basic Relationships between Pixels, Mathematical Preliminaries, 2D Linear Space Invariant Systems, 2D Convolution and Correlation.

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

**Image Enhancement:** Some Simple Intensity Transformations, Image Subtraction, Image Averaging, Spatial Domain Methods, Smoothing Filters, Sharpening Filters, Frequency Domain Methods, Lowpass Filtering, Highpass Filtering, Generation of Spatial Masks from Frequency Domain Specifications, Histogram Processing: Stretching, Equalization and Specification.

**Image Transforms:** 2D Orthogonal and Unitary Transforms, Properties and Examples. Introduction to the Fourier Transform, The Discrete Fourier Transform, 2D DFT, FFT, DCT, Hadamard Transform, Haar Transform, KL Transform.

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

**Image Restoration:** Degradations Model, Degradation Model for continuous and discrete functions, Diagonalization of Circulant and Block - Circulant Matrices, Effects of Diagonalization on the Degradation Model, Algebraic Approach to Restoration: Unconstrained Restoration, Constrained Restoration, Inverse Filtering, weiner filters, Removal of Blur Caused by Uniform Linear Motion, Restoration in the Spatial Domain, Geometric Transformation.

**Color Image Processing and Wavelets:** Color Image Processing Fundamentals, Color Models: RGB, CMY, CMYK, HSI, Relationship Between Different Models, Introduction to wavelets and resolution analysis.

**UNIT-IV (11 Hrs.)**

**Image Compression:** Fundamentals: Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria. Image Compression Models, Loss Less Variable Length, Huffman, Arithmetic Coding, Bit Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, Sub Band Coding.

**Image Segmentation:** Edge Detection, Line Detection, Curve Detection, Edge Linking and Boundary Extraction, Image Representation: Boundary Representation, Region Representation and Segmentation, Morphological Processing: Dilation, Erosion, Opening and Closing, Hit And Miss Algorithms.

**RECOMMENDED BOOKS**

1. Rafael. C. Gonzalez & Richard E. Woods. 'Digital Image Processing', 2/e Pearson Education, 2006
2. W.K. Pratt. 'Digital Image Processing', 3<sup>rd</sup> Edn., John Wiley & sons, Inc. 2006
3. M. Sonka et.al, 'Image Processing, Analysis and Machine Vision', 2<sup>nd</sup> Edn., Thomson, Course, India Edition, 2007.
4. Kenneth R. Castleman, 'Digital Image Processing', Pearson Education, 1995.
5. S. Jayaraman, S. Esakkirajan, T. Veerakumar, 'Digital Image Processing', McGraw Hill Education, 2009.
6. Anil Jain. K, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 1989.

**DATABASE MANAGEMENT SYSTEMS**

**Subject Code-MCSE0-F99**

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

**Duration – 36 Hrs.**

**COURSE OBJECTIVES**

To familiarize the students with Data Base Management system

**COURSE OUTCOME**

**CO1** To provide introduction to database systems and various models.

**CO2** To provide introduction to relational model and SQL

**CO3** To understand about Query Processing and Transaction Processing.

**CO4** To learn the concept of failure recovery and concurrency control

**UNIT-I (11 Hrs.)**

**Introduction to Database Systems:** File Systems Versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, Database System Architecture, DBMS Layers, Data independence.

**Data Models:** Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Class

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Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

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

**The Relational Model:** Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data

**Relational Query Languages: SQL:** Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Integrity Constraints in SQL, Cursors and Triggers  
Basic Query Optimization Strategies

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

**Database Design:** Functional Dependencies, Reasoning about Functional Dependencies, Normal Forms, Schema Refinement, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, Domain Key Normal Forms.

**Transaction and Concurrency Management:** ACID Properties, Serializability, Two-phase Commit Protocol, 2PL protocol, Lost Update Problem, Inconsistent Read Problem. Concurrency Control, Lock Management, Read-Write Locks, Deadlocks Handling.

**UNIT-IV (11 Hrs.)**

**Physical Data Organization:** File Organization and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index, Fixed length and Variable Length Records.

**Database Protection:** Threats, Access Control Mechanisms: Discretionary Access Control, Mandatory Access Control, Grant and Revoke, Role Based Security, Encryption and Digital Signatures.

**RECOMMENDED BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 'Database System Concepts', 6<sup>th</sup> Edn., Tata McGraw-Hill, 2011.
2. Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', 5<sup>th</sup> Edn., Pearson Education, 2010.
3. C.J. Date, 'An Introduction to Database Systems', Pearson Education, 8<sup>th</sup> Edn., 2006.
4. Alexis Leon, Mathews Leon, 'Database Management Systems', Leon Press, 1<sup>st</sup> Edn., 2008.
5. S.K. Singh, 'Database Systems Concepts, Design and Applications', 2<sup>nd</sup> Edn., Pearson Education, 2011.
6. Raghu Rama Krishnan, Johannes Gehrke, 'Database Management Systems', 3<sup>rd</sup> Edn., Tata McGraw-Hill, 2014

**ACCOUNTING AND FINANCIAL MANAGEMENT**

**Subject Code – MBAD0- F96**

**L T P C**

**Duration – 40 Hrs.**

**3 0 0 3**

**Course Objectives:** To provide an understanding of the function, the roles, the goals and the processes of corporate financial management, covering the sourcing of finances and their issues in investment and operations. Problem-solving methodology will be used to illustrate the theories and tools in financial decision making.

**Unit I (10 Hrs.)**

Overview: Accounting Concepts, Conventions and Principles, Accounting Equation, International Accounting Principles and Standards; Branches of Accounting: Financial, Cost and Management



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Accounting and Their Inter-Relationships, Mechanics of Accounting: Double Entry System of Accounting, Journalizing of Transactions

**Unit II (10 Hrs.)**

Preparation of Final Accounts: Profit & Loss Account, Profit & Loss Appropriation Account and Balance Sheet, Common Size Statement; Comparative Balance Sheet and Trend Analysis  
Cost Accounting – Objectives, Elements of Cost, Marginal Costing, Absorption Costing, Target Costing, Standard Costing, Different Methods of Costing, Break Even Analysis, Its Uses and Limitations, Break Even Chart

**Unit III (10 Hrs.)**

Financial Management Nature, Scope and Objectives of Financial Management, Ratio Analysis Fund Flow Statement and Cash Flow Statement, Working Capital Decision: Meaning, Nature and Scope of Working Capital – Component of Working Capital – Factors affecting Working Capital, Working Capital Strategies

**Unit IV (10 Hrs.)**

Cost of Capital, WACC, Investment Decision: Nature and Significance of Investment Decision, Capital Budgeting Techniques: Discounted and Non-Discounted Methods (Pay Back, ARR, NPV, IRR, Benefit Cost Ratio), Long Term and Short Term Sources of Funds

**Course Outcomes:** After completing this course the students should be able to make optimum decisions pertaining to raising funds, making investments & managing the assets of a corporation, big or small, with an ultimate goal of creating value.

**Recommended Books**

1. Brigham, 'Financial Management: Text & Cases', Cengage Course.
2. Brealy & Myres, 'Principles of Corporate Finance', Tata McGraw Hill.
3. Ambrish Gupta, 'Financial Accounting for Management', 2<sup>nd</sup> Edn., Pearson Education,
4. I.M. Pandey, 'Financial Management', Vikas Publishers
5. S.P. Jain and K.L. Narang, 'Principles of Accounting', Kalyani Publishers, New Delhi, 2004

**BUSINESS ETHICS**

**Subject Code: MBAD0- F97**

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

**Duration: 40 Hrs.**

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

**Introduction to Ethics and Values and their Importance in Business:** Ethical issues in Capitalism and Market System, Ethical and Social System. The Social Responsibility of Business, Ethical Conflict, Whistle Blowing.

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

Ethics and Organization, Ethics in Human Resource Management and Organizational Culture, Ethics in Marketing, Ethics in Finance, Ethical Codes and Incentives in Corporate Sector.

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

Broader Ethical issues in Society – Corruption, Ecological Concern, Discrimination on the Basis of Gender, Caste or Race, Ethics and Information Technology.

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

Impact of Group Policies and Laws of Ethics, Resolving Ethical dilemma.

**Recommended Books**

1. R.C. Shekhar, 'Ethical Choices in Business', Response Book, New Delhi.

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2. S.C. Chakraborty, 'Managerial Transformations by Value', Sage Publications, New Delhi, 1993.
3. Ananta K. Giri, 'Values, Ethics and Business: Challenges for Education and Management', Rawat Publication, Jaipur

**ENGINEERING ECONOMICS & INDUSTRIAL MANAGEMENT**

**Subject Code: MBAD0- F98**

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

**Duration: 40 Hrs.**

**Course Objectives:** To run an organization Finance and Human resources are the key factors. Their proper utilization decides its success. This course will give the basic understanding of both these resources.

**UNIT-I (8 Hrs.)**

**Prerequisite:** Basic Management Principles, C S.

**Introduction:** Scope of economics for engineers; Concept of: Goods, Utility, Value, Price, Capital, Money, Income; Law of Demand & Supply; Time value of money.

**UNIT-II (11 Hrs.)**

**Cost Analysis:** Cost classification: Prime cost, Overhead cost, Selling and Distribution Cost, Fixed cost, Variable cost, Implicit cost, Explicit cost, Replacement cost, Opportunity cost, Marginal cost and Sunk cost; Break even analysis; Economic order quantity.

**Depreciation:** Causes and Methods: Straight line method, Reducing balance method, Repair provision method, Annuity method, Sinking fund method, Revaluation method, Sum of the digit method.

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

**Replacement analysis:** Reasons and factors for replacement; Determination of economic life of an asset; Payback period method, Annual cost method, Present worth method.

**Human Resource Management:** Definition; Functions of HRM; Process of Human Resource Planning; Methods of Recruitment; Meaning of Placement and Induction.

**UNIT-IV (11 Hrs.)**

**Training and Development:** Difference between Training and Development; methods of training and development; Promotion: merit v/s seniority; Performance Appraisal: Traditional and Modern methods; Meaning of Career Planning and Development; Career anchors; Career paths for various types of jobs; Problems in career Planning and Development.

**Recommended Books**

1. T.R. Jain, 'Micro Economics' V.K. Publications.
2. P. Khanna, 'Industrial Engineering and Management', Dhanpat Rai Publication (P) Ltd.
3. M.S. Mahajan, 'Industrial Engineering and Production Management', Dhanpat Rai & Co. Pvt. Ltd.
4. T.N. Chhabra, 'Human Resource Management', Dhanpat Rai & Co.
5. P.L. Mehta, 'Managerial Economics', Sultan Chand & Sons.

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**BASIC ACCOUNTING**

**Subject Code: MBAD0-F99**

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

**Duration: 40 Hrs.**

**Objective/s & Expected Outcome:** This course provides an orientation in the field of accounting and basic accounting fundamentals. After completion of this course, candidate would be able to record and post transactions in the basic accounting equation and maintain subsidiary ledgers.

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

**Basic Accounting Concepts:** Background of Accounting, Introduction, importance and scope, Accounts– Types and classification; basic terms– Capital, Income, Expenditure, Expenses, Assets, Liabilities and application to Problems. Accounting Equation, Double Entry System. Generally accepted accounting principles (GAAP)

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

**Journal and Ledger:** Journal and recording of entries in journal with narration; Ledger –Posting from Journal to respective ledger accounts. Basic concepts of purchase book, sales book and cashbook.

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

**Trial Balance:** Need and objectives; Application of Trial Balance; different types of errors escaped, trial Balance preparation.

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

**Final Accounts:** Final Accounts without adjustments. Bank Reconciliation Statement: Bank transactions, Preparation of simple bank reconciliation statement. Application of Computer in Accounting

**Recommended Books**

1. Jawahar Lal, 'Managerial Accounting', 1<sup>st</sup> Edn.
2. R.K. Mittal & M.R. Bansal, 'Financial Accounting'.
3. Rajni Sofat & Preeti Hiro, 'Basic Accounting', 2<sup>nd</sup> Edn.
4. Bhattacharya & Deaden, 'Accounting for Management', Paperback Edn., Vikas Publications, 1986.
5. R.L Gupta & V.K. Gupta, 'Financial Accounting', (Part I and Part II).
6. S.N. Maheshwari, 'Fundamental Accountancy'.
7. Antony & Reece, 'Accounting Principal', 6<sup>th</sup> Edn.

**DYES, SOAP AND DETERGENTS**

**Subject Code: MCHM0-F92**

**L T P C**

**Contact Hrs.**

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

**Dyes:**

Introduction, Classification of Dyes, Theory of colour and chemical constitution (Valence Bond Theory, M. O. Theory, Witt's Theory) textile fibers and application of dyes. Analysis and estimation of dyes. Fastness and properties, Synthesis and application of the following dyes: Methyl violet and Eosin, Fluorescein, Congo red, Auramine and Malachite green, Methylene blue, Alizarine, Direct black 1, Direct green, indanthrene blue and Dibenzanthrone, Eriochrome Black T, Rhodamine B and Acriflavine.

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**UNIT-II (8 Hrs.)**

**Soaps:** Introduction, Raw Materials, Manufacturing process, Classification, mechanism of cleaning action, Recovery of glycerin from spent lye. Estimation of free alkali and phenol in soap.

**UNIT-III (8 Hrs.)**

**Detergents:** Introduction, Classification of surface active agents, Anionic, Cationic, Amphoteric and non-ionic detergents, Principal groups of synthetic detergents, Biodegradability of surfactants, Difference between soaps and detergents, Enzyme containing and Eco friendly detergents (Zeolites).

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

Analysis of soaps and detergents: General scheme of analysis, sampling, alcohol soluble materials, moisture and volatile matter, analysis of soap (saponifiable, unsaponifiable) and for unsaponified matter in soaps, active ingredient and equivalent combined  $\text{SO}_3^{3-}$ , Tests for soaps: total fatty acids, fatty anhydride combined alkali, and anhydrous soap, free glycerol, Tests for synthetic detergents: Unulfonated or unulfated matter, ester  $\text{SO}_3$ , Alkalinity, chlorides, silicate, phosphate, borates, UV spectroscopic analysis of detergents: Biodegradability of detergents, Determination of sodium alkyl benzene sulfonate, determination of sodium toluene sulfonate, determination of sodium xylene sulfonate, determination of germicides in soaps and detergents

**Books Recommended**

1. F.W. Billmeyer, 'Textbook of Polymer Science', 3<sup>rd</sup> Edn., 1994.
2. F. Rodrigue, 'Principles of Polymer Systems', Tata McGraw Hill, New Delhi.
3. P.J. Flory, 'Principles of Polymer Systems', Cornell University Press, New York.
4. Dryden, 'Chemical Process Industries, Shrieves Chemical Technology'.
5. Shah and Pandey, 'Chemical Technology'.
6. G.R. Chatwal, 'Synthetic Dyes'.
7. M. Swaminathan, G.F. Longonan, 'The Analysis of Detergents and Detergent Products', J.W.
8. Davidsohn & B.M. Mlwidaky, 'Synthetic Detergents', Book Center, Mumbai.
9. P.P. Singh and D.W. Rangokav, 'An Introduction to Synthetic Dyes'.
10. K. Venkat Ramman, 'The Chemistry of Synthetic Dyes', Vol I and II.
11. O.P. Agarwal, 'Synthetic Organic Chemistry: Dyes and Drugs'.

**ADVANCED POWER PLANT ENGINEERING**

**Course Code: MMEE0-F93**

**L T P C**

**Contact Hrs. 42**

**3 0 0 3**

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

**Introduction:** Energy sources for generation of electric power, types of power plant-their special features and applications, present status and future trends of energy resources, overview of utility systems, project implementation stages, load curves, tariff methods.

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

**Conventional Power Generation:** site selection, plant layout, steam generators, turbines, fossil and nuclear fuels, pulverizers and coal feeding, mill reject, combustion in furnace, coal handling, ash handling, electrostatic precipitators and bag filters, water systems, condensers, cooling towers, safety aspects, waste disposals, cogeneration, hydroelectric power generation, turbine specific speeds.

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

**Non-Conventional Power Generation:** Fluidized bed combustion, energy generation through wind, geothermal, tidal and solar energy, nuclear energy.

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

**Process Utility Systems:** Bulk solids storage and transport systems – silo/hoppers, conveyors, selection and process and instrumentation diagram for pumps, fans and compressors, piping system design, pipe supports, different valves, fittings, instrumentation and data logging systems, industrial fire protection systems, dust hazards.

**Recommended Books**

1. P.K. Nag, 'Power Plant Engineering', McGraw Hill, 2007.
2. A.K. Raja, A.P. Srivastava & M. Dwivedi, 'Power Plant Engineering', New Age Int., 2006.
3. C. Elanchezian, L. Saravankumar, B.V. Ramnath, 'Power Plant Engineering', I-K Int., 2007.
4. T.C. Elliot, K. Chen, R. Swanekamp, 'Stanadard Handbook of Power Plant Engineering', McGraw Hill Education, 1998.

**SCIENCE OF RENEWABLE ENERGY SOURCES**

**Subject Code: MPHY0-F92**

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

**Duration:**

**Unit-1**

**Introduction**

Production and reserves of energy sources in the world and in India, need for alternatives, renewable energy sources.

**Unit-2**

**Energy**

Thermal applications, solar radiation outside the earth's atmosphere and at the earth's surface, fundamentals of photovoltaic energy conversion. Direct and indirect transition semi-conductors, interrelationship between absorption coefficients and band gap recombination of carriers.

Types of solar cells, p-n junction solar cell, Transport equation, current density, open circuit voltage and short circuit current, description and principle of working of single crystal, polycrystalline and amorphous silicon solar cells, conversion efficiency. Elementary ideas of Tandem solar cells, solid-liquid junction solar cells and semiconductor-electrolyte junction solar cells. Principles of photo electrochemical solar cells. Applications.

**Unit-3**

**Hydrogen Energy**

Environmental considerations, solar hydrogen through photo electrolysis and photocatalytic process, physics of material characteristics for production of solar hydrogen. Storage processes, solid state hydrogen storage materials, structural and electronic properties of storage materials, new storage modes, safety factors, use of hydrogen as fuel; use in vehicles and electric generation, fuel cells, hydride batteries.

**Unit-4**

**Other Sources**

Nature of wind, classification and descriptions of wind machines, power coefficient, energy in the wind, wave energy, ocean thermal energy conversion (OTEC), system designs for OTEC.

**Recommended Books:**

1. S.P. Sukhatme, 'Solar Energy', Tata McGraw Hill, New Delhi, 2008.



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2. Fonash, 'Solar Cell Devices', Academic Press, New York, 2010.
3. Fahrenbruch and Bube, 'Fundamentals of Solar Cells, Photovoltaic Solar Energy', Springer, Berlin, 1983.
4. Chandra, 'Photoelectrochemical Solar Cells', 1<sup>st</sup> Edn., New Age, New Delhi.

**FUNDAMENTALS OF ELECTRONIC COMMUNICATIONS**

**Subject Code: MECE0-F96**

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

**Duration: 45 Hrs.**

**Course Objectives:**

1. To understand the essentials of communication system.
2. To provide the students about the concepts of analog and digital modulation techniques
3. To impart basic knowledge of wireless communication.

**Course Outcomes:**

1. An ability to learn analog communication system and modulation techniques
2. An ability to understand design of useful circuits required in analog communication system.
3. An ability to explore working of transmitter and receiver circuits used in communication.
4. To explore about wireless communication.

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

**Introduction to Communication Systems:** The essentials of a Communication system, modes and media's of Communication, Classification of signals and systems, Fourier Analysis of signals. Analog Communication & Digital Communication, Basic concepts of Modulation, Demodulators, Channels, Multiplexing & Demultiplexing.

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

**Amplitude Modulation:** Amplitude modulation, Generation of AM waves, Spectrum of AM, Demodulation of AM waves, DSBSC, Generation of DSBSC waves, Coherent detection of DSBSC waves, single side band modulation, generation of SSB waves, vestigial sideband modulation (VSB).

**Angle Modulation:** Basic definitions: Phase modulation (PM) & frequency modulation(FM), narrow band frequency modulation, wideband frequency modulation, spectrum of FM.

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

**Pulse Analog Modulation:** Introduction to Sampling theory, Time division (TDM) and Frequency Division Multiplexing (FDM), Pulse Amplitude Modulation (PAM), Pulse Time Modulation.

**Digital Modulation Techniques:** Introduction to ASK, FSK, BPSK, QPSK, M-ary PSK. PC-PC data Communication.

**UNIT-IV (11 Hrs.)**

**Wireless Communication:** Introduction to wireless communication systems, Applications of wireless communication systems, Types of wireless communication systems, trends in mobile communication systems.

**Recommended Books:**

1. Simon Haykins, 'Communication Systems', 4<sup>th</sup> Edn., John Wiley & Sons.
2. Singh & Sapre, 'Communication Systems', TMH.
3. G. Kennedy, 'Electronic Communication Systems', TMH.
4. Frenzel, 'Communication Electronics', TMH.
5. Theodore S. Rappaport, 'Wireless Communications: Principles and Practice', PHI Publication.

**ELECTRONIC INSTRUMENTATION**

**Subject Code: MECE0-F97**

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

**Duration: 45 Hrs.**

**Course Objectives**

1. To provide knowledge about different types of measuring, waveform generation, and analysis electronics instruments.
2. Exposure to various methods of data transmission and transduction.
3. Elaborate discussion about recorder & display devices.

**Course Outcomes**

1. Able to understand operation of different instruments and able to describe different terminology related to measurements.
2. A recognition and understanding of various analog measuring instruments.
3. Design Various types of Bridge circuits.
4. Measurement of Resistance and understanding of CRO

**UNIT – I (11 Hrs.)**

**Units, Dimensions and Standards:** SI Units, Determination of absolute units of current and resistance, Standards of EMF, Resistance, Capacitance, Mutual inductance and their construction, Equivalent circuit representation, Figures of Merit, Construction of variable standards and Decade Boxes.

**General Theory of Analog Instruments:** Primary and secondary instruments, indicating recording and integrating types, operating torques damping and controlling torques, Torque/weight ratio, pointers and scales.

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

**Analog Measuring Instruments:** Principles of operation, Construction, Errors, calibration, areas of application of the following types of instruments for measurement of voltage, current, power, energy, frequency and power factor: (a) PMMC (b) Dynamometer (c) Moving Iron (d) Induction (e) Thermal (f) Electrostatic Extension of Ranges by Shunts. Multipliers: Power and Energy Measurements in Poly Phase Circuits.

Potentiometers (Only Principles, Operation & applications of DC & AC potentiometer) (a) Simple concepts of potentiometers. (b) Principle of DC potentiometer, applications. (c) Principle operation of AC potentiometer with advantages/ Disadvantages/ applications.

**UNIT – III(11Hrs.)**

**Measurement of Resistances:** Low, Medium & High Resistance their measurement.

**Bridges:** Measurement of R, L, C, M, O by Wheatstone, Kelvin, Maxwell Hay, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Bridge sensitivity, Errors, Detectors, Shielding and screening, Wanger, Earthing.

**UNIT-IV (11 Hrs.)**

**Cathodes Ray Oscilloscopes:** Principles and working of CRO, CRO– probes, Measurement of voltage, frequency and phase angle with CRO.

**Recommended Books:**

1. A.K. Sawhney, Electrical & electronic Measurement and Instrumentation, Dhanpat Rai & Publishers.
2. J B Gupta, A course in Electrical and Electronics Measurement & Instrumentation, S.K. Kataria & Sons.

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3. W.D. Cooper, Electronic Instrumentation and Measurement techniques, PHI.

**RELIABILITY ENGINEERING**

**Subject Code: MECE0-F98**

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

**Duration: 45 Hrs.**

**Course Objectives**

1. To provide students with a comprehensive understanding on various aspects of reliability engineering
2. To enable students to understand reliability considerations in designing machine components, elements and systems
3. To ensure sound maintenance of machines and systems and bring about reliability improvement
4. To perform reliability engineering analysis and its management throughout the product life cycle.

**Course Outcomes**

After successful completion of this course the students will be able to:

1. Demonstrate understanding of basic reliability measures such as failure rate, availability, MTTR, etc.
2. Compute and evaluate reliability for redundant, series, and parallel systems
3. Develop fault trees and apply various reliability models to identify and analysis possible faults in machine systems and assess their impact on overall system reliability & maintainability.
4. Use reliability improvement techniques and undertake product testing.

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

**Introduction:** Definition for Reliability, Static and Dynamic Reliability Need for reliability Engineering, success and failure models, Causes of failures, catastrophic failures and degradation failures Characteristic types of failures, useful life of components, Exponential case of chance failure, Reliability Measures; MTBF, MTTR, hazard rate, probability distribution function, Derivation for exponential distribution function, other kinds of distributions, Binomial, Poisson uniform, Raleigh, Weibull, Gamma distribution, marks, Chains, failures data analysis.

**UNIT-II (11 Hrs.)**

**Series Parallel Systems:** Reliability Block Diagrams, series systems, parallel systems, K-out-of-M systems, open and short circuits failures, standby systems.

Reliability Analysis of Non-Series Parallel System: Boolean algebra Method, Outset approach, delta star method, logical signal relation method, Bay's Theorem Method.

Reliability Prediction: objective of reliability prediction, classification, and information sources for failure rate data, prediction methodologies, general requirements, Role and limitations of Reliability prediction.

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

**Reliability Allocation:** subsystems reliability improvement, allocation for new units, criticality. Maintainability and Availability: forms of maintenance, measures of Maintainability and availability, maintainability function, availability function, two-unit parallel system with repair, Markov Model for two unit systems, preventive maintenance, provision of spares.

**UNIT-IV (11Hrs.)**

**Reliability Testing:** kinds of testing, component reliability measurements, parametric methods, confidence limits, accelerated testing, equipment acceptance testing, standard life testing plans, accelerated life testing, system safety analysis-FMECA, risk priority number and its allocation.

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Economics of Reliability Engineering: Reliability cost, Life Cycle Costing, effect of reliability on cost, reliability achievement cost models, reliability Utility cost models, Replacement policies.

**Recommended Books:**

1. K.K. Agarwal, 'Reliability Engineering', Kluwer Academic Press, USA.
2. E. Balagurusamy, 'Reliability Engineering', Tata McGraw Hill.
3. L.S. Srinath, 'Reliability Engineering', East West Press Pvt. Ltd.
4. Brijendra Singh, 'Quality Control and Reliability Analysis', Khanna Publishers.
5. E.E. Lewis, 'Introduction to Reliability Engineering', John Wiley and Sons.

**LINEAR CONTROL SYSTEMS**

**Subject Code: MECE0-F99**

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

**Duration: 45 Hrs.**

**Course Objectives:**

1. To introduce the elements of control system and their modelling using various Techniques.
2. To introduce methods for analysing the time response, the frequency response and the stability of systems
3. To introduce the state variable analysis method

**Course Outcomes:**

Upon completion of the course, students will be able to:

1. Analytical comparison between open & close loop system.
2. Modelling of linear control system.
3. Time domain and frequency domain analysis of control systems required for stability analysis.
4. Analysis of state models for linear control system.

**UNIT-I (8 Hrs.)**

**Basic Concepts:** Historical review, Definitions, Classification, Relative merits and demerits of open and closed loop systems.

**UNIT-II (11Hrs.)**

**Mathematical Models of Control System:** Linear and non-linear systems, Transfer function, Mathematical modelling of electrical, mechanical and thermal systems, Analogies, Block diagrams and signal flow graphs.

**Control Components:** DC servomotor, AC servomotor, Potentiometers, Synchronous, Stepper-motor.

**UNIT-III (14 Hrs.)**

**Time and Frequency Domain Analysis:** Transient and frequency response of first and second order systems, Correlation ship between time and frequency domain specifications, Steady-state errors and error constants, Concepts and applications of P, PD, PI and PID types of control.

**Stability Analysis:** Definition, Routh-Hurwitz criterion, Root locus techniques, Nyquist criterion, Bode plots, Relative stability, Gain margin and phase margins.

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

**State Variable Analysis:** Introduction, Concept of State, State variables & State models, State Space representation of linear continuous time systems. State models for linear continuous –time systems, State variables and linear discrete time systems, Solution of state equations, Concept of Controllability & Observability.

**Recommended Books:**

1. K. Ogata, 'Discrete time Control Systems', Prentice Hall International.

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2. Nagrath and Gopal, 'Control System Engineering', New Age International.
3. Warwick, Kevin, 'An Introduction to Control Systems', World Scientific Publishing Co. Pvt. Ltd.
4. Distefano, Joseph J. Stubberud, R. Allen, Williams, J. Ivan, 'Feedback and Control Systems', Schaums Series, TMH.

**ORDINARY DIFFERENTIAL EQUATIONS**

**Subject Code: MMAT0-F92**

**LT P C  
3 0 0 3**

**Contact Hrs.-32**

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

Linear Differential Equations: Basic theory of linear differential equations with constant coefficients, Homogeneous linear differential equations of second and higher order with constant coefficients, Method of variation of parameters to solve second degree equations.

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

Cauchy's homogeneous and Legendre's linear equation, Simultaneous linear equations with constant coefficients.

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

Leibnitz's linear and Bernoulli's equation, exact differential equations, Equations reducible to exact form by integrating factors.

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

System of differential equations, Eigenvalue problems: Sturm-Liouville problem.

**Recommended Books**

1. D.A. Murray, 'Introductory Course in Differential Equations,' Orient Longman (India), 1967.
2. Simmons, 'Differential Equations', TMH Edn., New Delhi, 1974.
3. M.S.P. Eastham, 'Theory of Ordinary Differential Equations,' Van Nostrand, London, 1970.
4. S.L. Ross, 'Differential Equations', John Wiley & Sons, New York, 1984.
5. Erwin Kreyszig, 'Advanced Engineering Mathematics', John Wiley and Sons, New York.
6. Richard Bronson, 'Differential Equations,' 2<sup>nd</sup> Edn., Schaum's Outline Series,

**NUMERICAL METHODS**

**Subject Code: MMAT0-F93**

**LT P C  
3 0 0 3**

**Contact Hrs.-36**

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

Errors in numerical calculations: Error and their analysis, General error formula, Errors in a series approximation. Solution of Algebraic and Transcendental Equations: Bisection Method, Regula-Falsi Method, Iteration method, Newton-Raphson Method.

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

Solution of linear system of equations: Gauss-Elimination Method, Gauss Jordan method, Eigen value problems (by Power method only), Jacobi Method, Gauss- Seidal Method.

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

Interpolation: Finite differences, Difference of a polynomial, Newton's formula for interpolation, Central difference interpolation formula, Interpolation with unevenly spaced points, Newton's divided differences formula



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

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson 3/8th rule, Newton-cots integration formula, Gaussian integration (one dimensional).

**Recommended Books**

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, 'Numerical Methods Scientific and Engineering Computation', 4<sup>th</sup> Edn., New Age International Publishers, New Delhi, 2003.
2. S.S. Sastry, 'Introductory Methods of Numerical Analysis', 5<sup>th</sup> Edn, PHI, 2012

**ADVANCED TRANSDUCER TECHNOLOGY**

**Subject Code: MELE0-F95**

**L T P C  
4 0 0 4**

**Contact Hrs.-36**

**Unit-I**

Introduction to Transducers and Its Classification, Characteristics of Transducers, Selection Criteria of Transducers, Errors in measurement. Types of errors – Statistical analysis of measurement data – Mean, Standard Deviation, Probability errors.

**Unit-II**

Variable Resistance transducers and its types. Concept of Three Wire and Four Wire RTDs. Potentiometers, strain gauges, resistance thermometers, thermistors, hotwire anemometers, Variable Inductance and variable capacitance transducers. Piezoelectric, Magnetostrictive, Electromagnetic transducers, thermo-electric sensor, semiconductor temperature sensors. Force balance transducers.

**UNIT-III**

**Analog Signal Conditioning Techniques:** Bridge Amplifier, Carrier Amplifiers, Charge Amplifiers and Impedance Converters, Modulation and demodulation Techniques, dynamic compensation, linearization, multiplexing and de-multiplexing.

**UNIT-IV**

**Digital Interfacing Techniques:** Interfaces, processors, code converters, liberalizers, Single transmission Cable transmission of analog and digital signal, fiber optic signal transmission, radio, telemetry, pneumatic transmission. Signal Display/Recording systems, Graphic display systems, storage oscilloscope, recorders-ink, thermal, UV, Smart Sensors.

**RECOMMENDED BOOKS:**

1. E.O. Doebelin, 'Measurement Systems: Application and Design', McGraw Hill International.
2. D. Patranabis, 'Sensors and Transducers', Wheeler Pub., New Delhi.
3. Murthy, D.V.S., 'Transducers and Instrumentation', PHI, New Delhi.
4. Swobada, G., 'Telecontrol: Methods and Applications of Telemetry and Remote Control', Van Nostrand.
5. H.K. Newbert, 'Instrument Transducers', Oxford University Press.

**ELECTRIC TRACTION SYSTEM**

**Subject Code: MELE0-F96**

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

**Contact Hrs.-36**

**UNIT-I**

**1. Traction Systems and Latest Trends:** Present scenario of Indian Railways – High speed traction, Metro, Latest trends in traction-Metro, monorail, Magnetic levitation Vehicle, Steam, diesel, diesel-electric, Battery and electric traction systems, General arrangement of D.C., A.C. single phase and 3-phase, Composite systems, Choice of traction system - Electric and Diesel-Electric.

**UNIT-II**

**2. Mechanism of Train Movement:** Analysis of speed time curves for main line, suburban and urban services, Simplified speed time curves. Relationship between principal quantities in speed time curves, Requirement of tractive effort, Specific energy consumption and Factors affecting it.

**UNIT-III**

**3. Traction Motors and their Control:** Features of traction motors, Significance of D.C. series motor as traction motor, A. C. Traction motors-single phase, Three phase, Linear Induction Motor, Comparison between different traction motors, Series-parallel control, Open circuit, Shunt and bridge transition, Pulse Width Modulation control of induction motors, Types of electric braking system.

**UNIT-IV**

**4. Electric Locomotives:** Important features of electric locomotives, Different types of locomotives, Current collecting equipment, Coach wiring and lighting devices, Power conversion and transmission systems, Control and auxiliary equipment, Distribution systems pertaining to traction (distributions and feeders), Traction sub-station requirements and selection, Method of feeding the traction sub- station.

**RECOMMENDED BOOKS:**

1. R.B. Brooks, 'Electric Traction Hand Book', Sir Isaac Pitman and Sons Ltd. London.
2. A.T. Dover, Mac Millan, 'Electric Traction', Dhanpat Rai and Sons, New Delhi.
3. J. Upadhyay, S.N. Mahendra, 'Electric Traction', Allied Publishers Ltd., Dhanpat Rai and Sons, Delhi.
4. H. Partab, 'Modern Electric Traction', Dhanpat Rai and Sons, New Delhi.
5. J.B. Gupta, 'Electric Power Utilization', Kataria and Sons, New Delhi.

**POWER ELECTRONIC DEVICES AND CONTROLLERS**

**Subject Code: MELE0-F97**

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

**Contact Hrs.-36**

**Course Objectives:**

1. Learn the physics of device operation, static and dynamic characteristics, ratings, protection, operating limitations and safe operating area
2. Know about the design issues of drive circuits and their usage
3. Understanding the different types of inverters and cyclo-converters

**Course Outcomes:**

1. Knowledge of power semiconductor devices and their Gate and base drive circuits

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2. Develop skills to utilize the different PWM schemes
3. Know about the different types of power converters and their applications

**UNIT-I**

**1. Review of semiconductor devices:** Conduction Process in semiconductors, pn Junction, Charge control description, Avalanche breakdown, Power diodes, Thyristors, Gate Turn Off thyristor (GTO), VI characteristics, Dynamic characteristics, ratings, protection.

**UNIT-II**

**2. Power MOSFET and IGBT:** Basic structure, I-V Characteristic, Physics of device operation, switching characteristics, operating limitation and safe operating area.

**3. Emerging Devices and Circuits:** Power junction Field effect transistor (FET), Integrated Gate-Commutated Thyristor (IGCT), Field Control Thyristor, Metal oxide semiconductor (MOS) Control Thyristor etc. Power ICs, New semiconductor materials.

**UNIT-III**

**4. Snubber Circuits:** Types of Snubber circuits, needs of Snubber circuit with diode, thyristor and transistors, Turn-off Snubber, over voltage snubber, turn on snubber, Snubber for bridge circuit configurations, GTO Snubber circuit.

**UNIT-IV**

**5. Gate and Basic Drive Circuits:** Design Consideration, De-coupled drive circuits, electrically isolated drive circuits, cascade connected drive circuits, Power device protection in drive circuits, circuit layout considerations.

**RECOMMENDED BOOKS:**

1. 'Power Electronics: Converters, Applications and Design' by Mohan, Undeland and Robbins John Wiley Sons.
2. 'Power Electronics Handbook' by Rashid M.H., Elsevier Press (Academic Press Series).
3. 'The Power Thyristor and its Applications' by Finney D., McGraw Hill, New York.
4. 'Power Electronics' by Lander C. W., McGraw Hill Book Co., U.K.
5. 'Power Electronics - Circuit

**INTELLECTUAL PROPERTY RIGHTS**

**Subject Code: MBAD0-FX1**

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

**Contact Hrs.-36**

**Course Objectives**

To impart knowledge of designing concepts of fabric and apparels, etc.

**Unit-I**

Intellectual property rights and its importance. Overview of world intellectual property organization (WIPO) and their role. IPR in perspective of India. Introduction to copyright, patent, industrial designs and trade. Concept of IPR in textile and fashion industries.

**Unit-II**

**Copy Right:** definition, types of works that are covered by copyright, rights protected by copy rights-economic rights, moral rights. Right of reproduction: right of public performance, broadcasting and communication to the public. Right of translation and adaptation. Step to get copy right, limitation and general duration of copy right. International agreements concerning copyright.

**Related Rights:** right of performers, broadcasting organization.

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**Unit-III**

**Trademarks:** introduction, signs that may serve as trademarks, Madrid agreement, procedure for getting trademark register, geographic indications. Appellation of origin.

Industrial design: introduction, different between industrial design, trademark and patent. Procedure for protection of Industrial design, general duration of Industrial design.

**Unit-IV**

**Patents:** purpose, need of patent, required condition for patentability. Procedure for filing the patent application. Limitation and advantages of patenting. Issue of enforcement and licensing, patent cooperation treaty.

**Unfair Competition:** introduction, acts of unfair competition and protection.

Applications of IPR in textile and fashion industries.

**OPERATION RESEARCH AND STATISTICS OF ENGG.**

**Subject Code: MMAT0-F95**

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

**Contact Hrs.-36**

**Course Objectives**

To impart knowledge of statistical tools, designing of experiments, etc.

**Unit-I**

**Linear Optimization Models:** Formulation of linear – programming problems.

**Graphical solution. Simplex algorithms:** Prig M method, two phase Method, Dual Simplex algorithm (Numericals based on these methods). Transportation problems (including time minimizing transportation problems). Assignment problems including traveling salesman and airline crew problems. Degeneracy in Transportation problems.

**Unit-II**

**Introduction to Sequencing Models:** Problems based on n jobs 2 machines, 4 jobs in machines. Gantt chart.

**Introduction to Networking Planning:** CPM: Concept, difference from PERT. Critical path. Floats PERT. Concept, critical path finding, problems involving probability of project completion/

**Unit-III**

Concept of probability. Additive and multiplicative laws of probability. Random variables. Mathematical expectation. Discrete and continuous probability distributions (Definitions, and problems only). Binomial, Poisson and normal distributing (properties and applications). Concept of sampling. Techniques of sampling. Sampling distribution. Test of hypothesis. Type I and Type II errors. Level of significance and P-value approach.

**Unit-IV**

Test of significance for large and small samples.  $\chi^2$  test for goodness of fit. t-test. F-test.

Analysis of variance (one way and two way classifications).

Introduction to MATLAB and its applications.

**Recommended Books**

1. C.K. Mustafi, 'Operations Research Methods and Practices'.
2. Kantiswarup, P.K. Gupta, Manmohan, 'Operations Research'.
3. Gupta and S.D. Sharma, 'Operations Research'.
4. Gupta and Gupta, 'Business Statistics'.
5. Gupta and Kapur, 'Mathematical Statistics'.

6. M.P. Spiegel, 'Theory and Problems of Probability and Statistics'.

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