# *COURSE STRUCTURE & SYLLABI FOR VII SEMESTER*

# ELECTRONICS AND COMMUNICATION ENGINEERING

## VIISemester

| COURSE CODE | THEORY/LAB | L | T | P | C |
|---|---|---|---|---|---|
| AHM1102 | Management Science | 4 | 0 | 0 | 4 |
| AEC1126 | Radar Engineering | 4 | 1 | 0 | 4 |
| AEC1127 | Data Communications | 4 | 1 | 0 | 4 |
| AEC1128 | Optical Communications | 4 | 1 | 0 | 4 |
| | **Elective-I** | 4 | 1 | 0 | 4 |
| AEC1129 | Digital Image Processing | | | | |
| AEC1130 | Bio Medical Instrumentation | | | | |
| AEC1131 | Robotics | | | | |
| AIT1114 | Data structures for Engineering Applications | | | | |
| AEE1142 | Design Concepts for Engineers | | | | |
| | **Elective-II** | 4 | 1 | 0 | 4 |
| AEC1132 | Satellite Communication | | | | |
| AEC1133 | EMI/EMC | | | | |
| ACT1108 | Operating Systems | | | | |
| ACS1114 | Software Development Engineering | | | | |
| AEE1125 | Reliability Evaluation of Engineering Systems | | | | |
| AEC1134 | Microwave & Optical Communication Lab | 0 | 0 | 3 | 2 |
| AEC1135 | Digital Signal Processing Lab | 0 | 0 | 3 | 2 |
| AEC11MP | Industry Oriented Mini-Project | - | - | - | 2 |
| | **Total** | **24** | **5** | **6** | **30** |

* Mini Project to be carried out during the summer vacation after VI Semester examination

* Evaluation at the beginning of the VII Semester

# MANAGEMENT SCIENCE

**Course Code: AHM 1102**

| L | T | P | C |
|---|---|---|---|
| 4 | 0 | 0 | 4 |

**AIM :**

To familiarize with the process of management and to provide basic insights to select contemporary management practices.

**OBJECTIVE :**

To understand the management processes and evolve management levels for effective decision making

**UNIT-I**

**INTRODUCTION TO MANAGEMENT :** Concepts of Management and Organization – Nature, Importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne experiments, Maslow's Theory of human needs, Douglas Mc Gregor's Theory X and Theory Y, Hertzberg's Two factor Theory of motivation, Systems approach to Management, Leadership styles

**UNIT-II**

**DESIGNING ORGANIZATIONAL STRUCTURES :** Basic concepts related to Organization, Departmentation and Decentralization, Types of Mechanistic and Organic Structure of Organization (Line Organization, Line and staff Organization, Functional Organization, Committee Organization, Matrix Organization, Virtual Organization, Cellular Organization, Team Structure, Boundary less Organization, Inverted Pyramid Structure, Lean and Flat Organization Structure) and their merits, demerits and suitability

**UNIT-III**

**OPERATIONS MANAGEMENT :** Principles and Types of Plant Layout, Methods of Production (Job, Batch and Mass Production),

Work Study, Basic procedure involved in Method Study and Work Measurement, Statistical Quality Control: R chart, P chart, C chart (Simple numerical problems)

**UNIT-IV**

**MATERIALS MANAGEMENT :**

Objectives, Need for Inventory control, EOQ, ABC & VED Analysis, Purchase Procedure, Stores Management and Stores Records (simple numerical problems)Just in Time System (JIT)

**UNIT-V**

**MARKETING MANAGEMENT :** Functions of Marketing, Marketing mix, marketing strategies based on product life cycle, Channels of distribution, Consumer behavior and Customer relationship management

**UNIT-VI**

**HUMAN RESOURCES MANAGEMENT :** Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR ), HRM vs. PMIR, Basic functions of HR Manager : Manpower planning, Recruitment, Selection, Training and Development, Placement, Performance Appraisal, Job Evaluation and Merit Rating Grievance handling and Welfare Administration

Introduction to Social Security Laws: Payment of Gratuity Act (1972), Employees Provident Fund & Miscellaneous Provisions Act (1958), Employees State Insurance Act (1948)

**UNIT-VII**

**PROJECT MANAGEMENT (PERT / CPM) :** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, probability of completing the project within given time, project cost analysis, project crashing (simple numerical problems)

**UNIT-VIII**

**STRATEGIC MANAGEMENT :** Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Steps in strategy formulation and implementation, value Chain Analysis, SWOT Analysis

Corporate social responsibility, business ethics and corporate governance

## TEXT BOOKS :

1. A R Aryasri, Management Science, Tata McGraw Hill, 2/e, 2007
2. O P Khanna, Industrial Engineering and Management, Dhanpat Rai Publishers, 2/e,2007

## REFERENCE BOOKS :

1. Azhar Kazmi: Business Policy and Strategic Management, Tata McGraw Hill, 3rd Edition, 2008.
2. S D Sharma : Operations Research, Kedarnath Ramnath& Co
3. Philip Kotler & Keller : Marketing Management, Pearson Education, 13th Education, 2008.
4. C B Mamoria & C B Mamoria : Personnel Management, Himalaya Publishers, 12th Edition, 1996.
5. B S Goel: Production and Operations Management, Pragati Prakasan, 2nd Edition, 1979.
6. Strategic Management: R Srinivasan, Eastern Economy Edition, PHI, 3rd Edition, 2008.
7. L M Prasad: Principles and Practice of Management, Sultan Chand & Sons, 7th Edition, 2008.

# RADAR ENGINEERING

**Course Code: AEC1126**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To impart basic principles of Radar Engineering that are essential for defense and core industry.

**OBJECTIVE:**

To impart the students with basic principles of Radar, types of radars, Tracking techniques, basic radar receiver, noise and signal processing.

**UNIT-I**

**INTRODUCTION** : Nature of Radar, Maximum Unambiguous Range, Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications.

**UNIT-II**

**RADAR EQUATION :** Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses.

**UNIT-III**

**CW AND FREQUENCY MODULATED RADAR :** Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar.

**UNIT-IV**

**MTI AND PULSE DOPPLER RADAR :** Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters.

MTI Radar Parameters, Limitations to MTI Performance, Non-coherent MTI, MTI versus Pulse Doppler Radar.

**UNIT-V**

**TRACKING RADAR :** Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Phase Comparison Monopulse, Target Reflection Characteristics and Angular Accuracy, Tracking in Range, Acquisition and Scanning Patterns. Comparison of Trackers.

**UNIT-VI**

**DETECTION OF RADAR SIGNALS IN NOISE :** Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

**UNIT-VII**

**RADAR RECEIVERS :** Noise Figure and Noise Temperature, Displays – types, Duplexers – Branch type and Balanced type, Circulators as Duplexers, Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations.

**UNIT-VIII**

**RADAR STUDIES OF THE ATMOSPHERE:** Introduction, Scattering mechanisms, MST radar, meteor wind radar, other radar studies of the atmosphere.

**TEXT BOOKS :**

1. Introduction to Radar Systems – Merrill I. Skolnik, 3rd Edition, McGraw-Hill, 1981.
2. Simion. Kingsley, “Understanding Radar Systems”, Standard publishing,1999.

**REFERENCES :**

1. Byron. Edde, “Radar Principles, Technology, Applications” pearson education, 2007.

# DATA COMMUNICATIONS

**Course Code: AEC1127**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM & OBJECTIVE:**

To make the students understand the Data Networks in order to analyze different modulation techniques and transmission media.

**UNIT-I**

**INTRODUCTION :** Basics of Digital Communication, Communication channel, Measure of information, Communications Circuits, Serial and parallel Transmission, Circuit Arrangements and Networks, Bit Rate, Baud rate, Entropy.

**UNIT-II**

**MODULATION TECHNIQUES :** Baseband, Baseband pulse shaping, PCM, FSK, MSK, BPSK, QPSK, 8 & 16-PSK, 8 & 16 QAM, Band width efficiency, carrier recovery, clock recovery, Bit recovery, Probability of error, Inter Symbol Interference (ISI), Performance Analysis and Comparison.

**UNIT-III**

**CODES, ERROR CONTROL & DATA FORMATS :** Character Codes, Bar Codes, Error Control, Error Detection, Error Correction, Character Synchronization.

**UNIT-IV**

**PROTOCOLS:** Data Link Protocol Functions, Character and Bit - Oriented Protocols, Transmission Modes, Data Link Protocols- Synchronous & Asynchronous, Synchronous Data Link Control, High Level Data Link Control.

**UNIT-V**

**DIGITAL MULTIPLEXING:** TDM, CODECS, COMBO CHIPS , Line Encoding, Frame Synchronization, Frequency Division Multiplexing,Wave length Division Multiplexing, T1 Carrier .

**UNIT-VI**

**COMMUNICATION EQUIPMENT :** Serial and Parallel Interfaces, Voice Networks and Circuits, Digital Service Unit and Channel Service Unit, LCU, Voice- Band Data Communication Modems, Asynchronous & Synchronous Voice-Band Modems, Modem Synchronization, Cable Modems, Wireless Local loops.

**UNIT-VII**

**NETWORKS :** Topologies, Ethernet- Traditional, Fast and GIGA bit Ethernet, FDDI Public Data Networks, ISDN, B-ISDN.

**UNIT-VIII**

**MULTI MEDIA:** Digitization of Video and Audio, Compression, Streaming, Stored and Live Video and Audio, Real Time Interactive Video and Audio, VOD.

**TEXT BOOKS:**

1. Wayne Tomasi, "Electronic communication systems, fundamentals through advanced" Pearson 5th Edition, 2004.
2. William Stallings, "Data and computer communications" Pearson Education India, 8th edition 2007.

**REFERENCES.**

1. N B Chakrabarti, "An Introduction to The Principles of Digital Communication", New Age International, 2007.
2. Behrouz A Forouzan, "Data Communication & Networking", Tata McGraw-Hill Education4th Edition.
3. Taub and schilling, "Principles of Communication Systems", 3rd Edition McGraw-Hill, 2008.
4. Simon Haykin, "Digital Communications", Reprint-2009 John Wiley & Sons, 1988.

# OPTICAL COMMUNICATIONS

**Course Code: AEC1128**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To teach basic concepts of Fiber Optic communications.

**OBJECTIVE:**

To give an exposure to the design of simple fiber optic networks.

**UNIT-I**

**OVERVIEW OF OPTICAL FIBER COMMUNICATION :** Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays. Cylindrical fibers- Modes, V number, Mode coupling, Step Index fibers, Graded Index fibers.

**UNIT-II**

**FIBER MATERIALS :** Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Fiber materials— Glass, Halide, Active glass, Plastic optical fibers, Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses.

**UNIT-III**

**TYPES OF DISPERSION :** Information capacity determination, Group delay, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion, Pulse broadening, Fiber Splicing- Splicing techniques, Splicing single mode fibers.

**UNIT-IV**

**OPTICAL SOURCES AND OPTICAL FIBER CONNECTORS :** Connector types, Single mode fiber connectors, Connector return loss, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints Optical sources- LEDs, Structures, Materials, Quantum efficiency,

LED Power, Modulation, Power bandwidth product.

Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, LD structure and radiation patterns, single mode lasers, temperature effects, Reliability of LED & ILD.

**UNIT-V**

**OPTICAL DETECTORS :** Physical principles of PIN and APD, detector response time, temperature effect on Avalanche gain , Comparison of Photo detectors.

**UNIT-VI**

**OPTICAL RECEIVER OPERATION :** Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit.

**UNIT-VII**

**OPTICAL SYSTEM DESIGN :** Considerations, Component choice. Point-to-point links, System considerations, Link power budget with examples, Rise time budget with examples.

**UNIT-VIII**

**LINE CODING AND MEASUREMENTS :** Line coding in Optical links, WDM, Necessity , Principles, Types of WDM, Measurement of Attenuation and Dispersion, Introduction to Synchronous digital hierarchy.

**TEXT BOOKS**

01. John M. Senior, "Optical Fiber Communications", PHI, 2nd Edition, 2002.

02. Gerd Keiser , "Optical Fiber Communications ," Mc Graw-Hill International edition, 4th Edition, 2000.

**REFERENCES:**

1. Joseph C. Palais, "Fiber Optic Communications" 5th Edition, Pearson Education, 2004.

2. D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner , "Fiber Optic Communications", Pearson Education,2005.

# DIGITAL IMAGE PROCESSING

(ELECTIVE – I)

**CODE: AEC1129**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

Digital Image Processing is a rapidly evolving field with growing applications in science and engineering. The aim of this course is to cover the basic theory and algorithms that are widely used in digital image processing and expose students to current technologies and issues that are specific to image processing systems.

**OBJECTIVE:**

- To understand theoretical foundations of digital image processing;
- To appreciate modern applications; and,
- To implement algorithms for image enhancement, filtering, restoration etc.

**UNIT-I**

**INTRODUCTION :** Digital image fundamentals, Concept of gray levels, Image sensing and Acquisition, Gray level to binary image conversion, Sampling and Quantization, Relationship between pixels.

**UNIT-II**

**IMAGE TRANSFORMS :** 2-D DFT, Properties, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Haar transform, Slant transform, Hotelling transform.

**UNIT-III**

**IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN :** Point processing, Histogram processing, Spatial filtering.

**UNIT-IV**

**IMAGE ENHANCEMENT IN FREQUENCY DOMAIN :** Image smoothing, Image sharpening, Homomorphic Filtering.

**UNIT-V**

**COLOR IMAGE PROCESSING:** Pseudo color image processing, full color image processing.

**UNIT-VI**

**IMAGE RESTORATION :** Degradation model, Algebraic approach to restoration, Inverse filtering, Least mean square filters, Constrained Least Squares Restoration, Interactive Restoration.

**UNIT-VII**

**IMAGE COMPRESSION:** Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression.

**UNIT-VIII**

**IMAGE SEGMENTATION:** Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.

**TEXT BOOK:**

1. R.C. Gonzalez & R.E. Woods, "Digital Image Processing" Addison Wesley/ Pearson education, 2nd Edition, 2002.
2. A.K.Jain , "Fundamentals of Digital Image Processing", PHI, 5th ed.

**REFERENCES:**

1. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddins, "Digital Image Processing using MAT LAB" , Pearson Education, 2004.
2. William K. Pratt, " Digital Image Processing" John Wilely, 3rd Edition, 2004.
3. Arthur R. Weeks, Jr., "Fundamentals of Electronic Image Processing " 3rd ed., SPIE Optical Engineering Press, 1996.
4. Jagadeesh Bandi, "Optimization between image quality and compression ratio", LAP LAMBERT Academic Publishing, Germany, 2012, ISBN:978-3-8484-1095-8.

# BIO MEDICAL INSTRUMENTATION

(ELECTIVE – I)

**Course Code: AEC1130**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To give a complete exposure of various recording mechanisms and physiological parameters measured for diagnostic application.

**OBJECTIVE:**

- To study different types of electrodes used in bio-potential recording.
- To understand the characteristics of bio-amplifiers and different types of recorders.
- To understand how to measure various biochemical and nonelectrical parameters of human system.
- To study the instrumentation concerned with measuring the blood flow
- To study the latest developments in medical imaging systems.

**UNIT-I**

**COMPONENTS OF MEDICAL INSTRUMENTATION SYSTEMS :** Bio-amplifier, Static and dynamic characteristics of medical instruments, Bio-signals and characteristics, Problems encountered with measurements from human beings, Organization of cell, Nernst equation and Goldman's Equation for membrane Resting Potential Generation, Propagation of Action Potential.

**UNIT-II**

**BIO-POTENTIAL ELECTRODES & TRANSDUCERS:** Electrode potential, Electrode equivalent circuit, Types of Electrodes-Surface Electrodes, Needle Electrodes, Micro Electrodes, Transducers for measuring the physiological parameters.

**UNIT-III**

**BIO-SIGNAL ACQUISITION :** Electrical Conduction system of the heart, ECG leads, Einthoven triangle, ECG amplifier, EEG 10-20 lead system, EEG amplifier, Specifications and Interpretation of ECG,EEG,EMG, ERG, EOG.

**UNIT-IV**

**BIO-SIGNAL MEASUREMENTS:** Blood flow meters- Electromagnetic blood flow meter, Ultrasonic Doppler blood flow meter. Blood pressure measurement- Ultrasonic blood pressure monitoring, Phonocardiograph- Heart sound Microphone and preamplifier, TMT Machine.

**UNIT-V**

**PHYSIOLOGICAL ASSIST DEVICES & THERAPEUTIC EQUIPMENT :** Pacemakers- External & internal, Defibrillators- External & internal, Different types of Hemodialyser and Hemodialysis machine, Heart-Lung machine – Oxygenators and Blood pumps, Audio meter, Opthalmoscope, Shortwave Diathermy, Microwave Diathermy and Ultrasound Diathermy.

**UNIT-VI**

**OPERATION THEATRE EQUIPMENT AND MONITORING EQUIPMENT:** Spiro meter, Pnemuotachography using strain-gauge, Plethysmography, Anesthesia machine, Ventilators, Surgical diathermy, Humidifiers, Neubilisers, Arrthmia Monitor, Holter monitor, Ambulatory Monitor, Fotal Monitor, Incubator.

**UNIT-VII**

**CLINICAL LABORATORY EQUIPMENT :** Colorimeter, Flame photometer, Spectrophotometer, Conductivity meter, Electrophoresis, Chromatography, Blood cell Counter, Blood gas analyzer: pH-$pCO_2$, $pO_2$, Auto-analyzer, Glucometer.

**UNIT-VIII**

**MEDICAL IMAGING EQUIPMENT:** X-ray generation, X-ray tube, X-ray machine, Computed Tomography (CT), Endoscope, Ultrasound Imaging system, Magnetic resonance Imaging (MRI), Nuclear Imaging

systems- Positron Emission Tomography (PET), Single Photon Emission Tomography (SPECT).

## TEXT BOOKS:

1. Leslie Cromwell and F.J. Weibell, E.A. Pfeiffer, "Biomedical Instrumentation and Measurements", PHI, 2nd ed, 1980.
2. Joseph J. Carr and John M. Brown," Introduction to Biomedical Equipment Technology", 4th edition, Pearson Education Asia, 2001.

## REFERENCES:

1. R.S. Khandpur, "Hand-book of Biomedical Instrumentation", TMH, 2nd Ed., 2003.
2. John Enderle, Susan Blanchand and John Bronzino," Introduction to Biomedical Engineering", Elsvier Publications ,2005.
3. John G. Webster, "Medical Instrumentation, Application and Design",John Wiley, 3rd ed., 2009.

# ROBOTICS

(ELECTIVE-I)

**Course Code: AEC1131**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM & OBJECTIVE:**

To inculcate the student to understand the components of a robotics and capability for designing from a system approach.

**UNIT-I**

**INTRODUCTION**: Automation and Robotics, An overview of Robotics–current and future applications – classification by coordinate system and control method.

**UNIT-II**

**CONTROL OF ACTUATORS IN ROBOTIC MECHANISMS**: Closed loop control in a position servo, effect of friction and gravity, frequency domain considerations, control of robotic joints, stepper motors, hydraulic actuators and pneumatic systems, servo amplifiers.

**UNIT-III**

**ROBOTIC SENSORY DEVICES**: Non-optical position sensors, velocity sensors, accelerometers, proximity sensors, noncontact proximity sensors, Touch and slip sensors, force and torque sensors, Speaker and microphone.

**UNIT-IV**

**VISION FOR ROBOTIC SYSTEM** : Imaging components, Image representation, hardware considerations, picture coding, object reorganization and categorization, software considerations, need for vision training and adaptation, Review of existing systems.

**UNIT-V**

**COMPUTER CONSIDERATIONS FOR ROBOTIC SYSTEMS** : Architectural considerations, hardware considerations, computational

elements in robotic applications, real time considerations, Robot programming, path planning, the robot's computer system.

**UNIT-VI**

**TRANSFORMATIONS AND KINEMATICS:** Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

**UNIT-VII**

**COMPONENTS OF THE INDUSTRIAL ROBOT :** Functional line diagram representation of robot arms, common types of arms, Components, Architecture, number of degrees of freedom – requirements and challenges of end effectors, determination of end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices, Motion Analysis: Homogeneous transformations as applicable to rotation and translation – problems.

**UNIT-VIII**

**ROBOT APPLICATION:** Material Transfer - Material handling, loading and unloading-Processing - spot and continuous arc welding – Electronic Assembly, Inspection and testing.

**TEXT BOOKS:**

1. Richard D. Klafter, Thomas A.Chmielewski, Michael Negin, "Robotic engineering: An integrated approach, Prentice- Hall, lnc., Englewood cliffs, NJ, USA, April, 2004.
2. Robert J. Schilling , "Fundamentals of Robotics : Analysis and Control" Prentice Hall, 1990.

**REFERENCES:**

1. Groover M P, "Industrial Robotics", McGraw-Hill, 1986.
2. Haruhiko Asada, Jean-Jacques E. Slotine, "Robot Analysis and Intelligence", Wiley-IEEE, 1986.
3. John J Craig, "Introduction to Robotics"3rd ed., Pearson/Prentice Hall, 2005.

# DATA STRUCTURES FOR ENGINEERING APPLICATIONS

(ELECTIVE-I)

**Course Code: AIT1114**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To empower students to build efficient software applications with suitable data structures.

**OBJECTIVE:**

To make students understand the software design techniques for solving engineering applications of their discipline

**UNIT-I**

**RECURSION AND LINEAR SEARCH :** Preliminaries of algorithm, Algorithm analysis and complexity, Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence, Towers of Hanoi. (Chapters 1, 2 from Text Book 1)

**UNIT-II**

**SEARCHING TECHNIQUES :** Introduction, Linear Search, Transpose Sequential, Search, Interpolation Search, Binary Search, Fibonacci Search.

(Chapter 15 from Text Book 2)

**UNIT-III**

**SORTING TECHNIQUES:** Basic concepts, insertion sort, selection sort, bubble sort, quick sort, merge sort. (Chapter 12 from Text Book 1)

**UNIT-IV**

**STACKS :** Basic Stack Operations, Representation of a Stack using Arrays, Stack Applications: Reversing list, Factorial Calculation, In-fix-to postfix Transformation, Evaluating Arithmetic Expressions. (Chapter 3 from Text Book 1)

**UNIT-V**

**QUEUES :** Basic Queues Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack. (Chapter 4 from Text Book 1)

**UNIT-VI**

**APPLICATIONS OF QUEUES :** Applications of Queues- Enqueue, Dequeue, Circular Queues, Priority Queues. (Chapter 4 from Text Book 1)

**UNIT-VII**

**LINKED LISTS :** Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, merging two single linked lists into one list, Reversing a single linked list, Circular linked list, Double linked list. (Chapter 6 from Text Book 2)

**UNIT-VIII**

**TREES :** Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays and linked lists, operations on a Binary tree, Binary Tree Traversals (recursive), Creation of binary tree from in-order and pre(post)order traversals.

(Chapter 8 from Text Book 2)

**TEXT BOOKS:**

1. Richard F, Gilberg & Behrouz A. Forouzan, " Data Structures", 2nd Edition, Thomson, 2007.
2. GAV PAI, "Data Structures and Algorithms", 1st Edition, Tata McGraw-Hill, 2010.

**REFERENCES:**

1. Seymour Lipschutz, "Data Structure with C", 1st Edition, TMH, 2009.
2. Debasis ,Samanta "Classic Data Structures", 2nd Edition, PHI,2009.
3. Horowitz,Sahni, Anderson "Fundamentals of Data Structure in C", 2nd Edition, Freed, University Press, 2009.

**Note**

A small application may be implemented in software from their respective disciplines at the end of the course.

# DESIGN CONCEPTS FOR ENGINEERS

(ELECTIVE – I)

**Course Code: AEE 1142**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

## AIM & OBJECTIVE:

To teach the principles of design, and how they apply to engineering design projects and future job activities. It teaches the design process, rather than the technical details of any one engineering field. Basic design principles of and design tools, are introduced.

## UNIT-I

What is engineering? Definition. Various fields of engineering. Engineering professional bodies.

## UNIT-II

What is design? Difference between analysis , design, and replication. Good design versus bad design. The design cycle. Overall objectives.

## UNIT-III

Modeling and analysis. Gathering information. Build document and test. Revise. Informal brain storming. Examples.

## UNIT-IV

Project management and team work skills. Working in a team . Building a team. Job description. Team meetings. Working with other teams.

## UNIT-V

Time line. Pert. Documentation. Logbook. Technical reports. Electronic documentation. Case studies.

## UNIT-VI

Engineering tools. Estimation. Significant figures. Plots.Prototyping. Reverse engineering. Computer analysis.

## UNIT-VII

The human machine interface. How people interact with machines. Ergonomics. Societies view of engineering. Learning from mistakes. Role of failure. Case studies.

## UNIT-VIII

Learning to speak, write, and make presentations. Importance of good communication. Preparing for meetings. Preparing a formal presentation. Technical papers. Proposals. Instructional manuals.

## TEXT BOOK:

1. Design Concepts for Engineers Mark .N Horenstien, Prentice Hall, 4th Edition, 2009.

## REFERENCE BOOK:

1. Balbir S. Dillon, "Advanced Design Concepts for Engineers", Technology Publishing Company, 1st Edition, 1998.

# SATELLITE COMMUNICATION

(ELECTIVE – II)

| Course Code: AEC1132 | L | T | P | C |
|---|---|---|---|---|
| | 4 | 1 | 0 | 4 |

**AIM:**

Students will learn Satellite Systems and Communications applications comprehensively and apply this knowledge for understanding the existing Modern Satellite Applications.

**OBJECTIVE:**

The flow of the syllabus enables students to understand the subject from basics to advanced technologies on Satellite Communications and get prepared for Industry and will not be needing extensive training on these aspects.

**UNIT-I**

**SATELLITE ORBITS :** Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility – eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

**UNIT-II**

**SPACE SEGMENT :** Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command.

**UNIT-III**

**EARTH SEGMENT :** Earth Station Technology— Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.

**UNIT-IV**

**SATELLITE LINK DESIGN :** Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

**UNIT-V**

**SATELLITE ACCESS :** Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption.

**UNIT-VI**

**SATELLITE APPLICATIONS-COMMUNICATIONS :** INTELSAT Series, INSAT, VSAT, Mobile satellite services : GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Specialized services : E –mail, Video conferencing, Internet.

**UNIT-VII**

**PRINCIPLES OF TV & BROADCASTING:** Gross structure, Image continuity, Scanning, flicker, interlaced scanning, number of scanning lines, Fine structure, Tonal Gradation. Video signal dimensions, Horizontal sync. details,Vertical sync. details, Scanning sequence details, Functions of vertical pulse train, Channel bandwidth, vestigial side band transmission, bandwidth allocations for colour transmission.

**UNIT-VIII**

**SATELLITE APPLICATIONS-BROADCAST :** Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- World space services, Business TV(BTV), GRAMSAT.

**TEXT BOOKS:**

1. Tri T. Ha, 'Digital Satellite Communication', 2nd edition, McGraw-Hill, 1990.
2. R R Gulati, "Monochrome and colour television", New Age International,2007.

## REFERENCES:

1. M. Richharia, 'Satellite Communication Systems-Design Principles", Macmillan 2003.
2. N.Agarwal, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986.
3. Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech House Bostan London, 1997.
4. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/ Pearson, 2007.

# EMI/EMC

(ELECTIVE-II)

**Course Code: AEC1133**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To impart the fundamentals that are essential for electronics industry in the field of EMI AND EMC

**OBJECTIVE:**

- To understand EMI sources and its measurements.
- To understand the various techniques for electromagnetic compatibility.

**UNIT-I**

**Introduction:** History and concept of EMI, Definitions of EMI/EMC, Electromagnetic environment, Practical experiences and concerns, frequency spectrum conservation, mechanisms of EMI generation, EMI testing, Methods of elimination of EMI and Biological effects of EMI.

**UNIT-II**

**NATURAL AND MANMADE SOURCES OF EMI/EMC:** Sources of Electromagnetic noise, typical noise paths, modes of noise coupling, designing for EM compatibility, lightening discharge, electro static discharge (ESD), electromagnetic pulse (EMP).

**UNIT-III**

**EMI FROM APPARATUS / CIRCUITS AND OPEN AREA TEST SIDES:** Electromagnetic emissions, noise form relays and switches, non-linearities in circuits, passive inter modulation, transients in power supply lines, EMI from power electronic equipment, EMI as combination of radiation and conduction, Open area test sides: OATS measurements, measurement precautions.

**UNIT-IV**

**RADIATED INTERFERENCE MEASUREMENTS:** Anechoic chamber, TEM cell, reverberating chamber, GTEM cell, comparison of test facilities.

**UNIT-V**

**CONDUCTED INTERFERENCE MEASUREMENT:** Characterization of conduction currents / voltages, conducted EM noise and power line, conducted EMI from equipment, immunity to conducted EMI, characteristics of EMI filters and power line filter design.

**UNIT-VI**

**GROUNDING AND CABLING:** Safety and signal grounds, low and high frequency grounding methods, grounding of amplifiers and cable shields, isolation, neutralizing transformers, shield grounding at high frequencies, digital grounding, types of cables, mechanism of EMI emission / coupling in cables.

**UNIT-VII**

**SHIELDING AND BONDING:** Effectiveness of shielding, near and far fields / impedances, methods of analysis, total loss due to absorption and reflection effects, composite absorption and reflection losses for electric fields / magnetic fields, magnetic materials as a shield, shield discontinuities, slots and holes, seams and joints, conductive gaskets Electrical Bonding, Shape and Material for Bond straps, General Characteristics of good bonds.

**UNIT-VIII**

**COMPONENTS FOR EMI /EMC STANDARDS :** Choice of capacitors, inductors, transformers and resistors, EMC design components National / International EMC standards, military and civilian standards.

**TEXT BOOKS:**

1. Dr. V.P. Kodali, " Engineering Electromagnetic Compatibility", IEEE Publication, S. Chand & Co. Ltd., New Delhi, 2000.
2. Electromagnetic Interference and Compatibility IMPACT series, IIT-Delhi, Modules 1-9.

**REFERENCES:**

1. C.R. Pal , "Introduction to Electromagnetic Compatibility", Ny John Wiley, 1992.

# OPERATING SYSTEMS

(ELECTIVE-II)

**Course Code:ACT1108**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

Gives the idea about the CPU scheduling and memory scheduling and now they implemented using respective algorithms.

**OBJECTIVE:**

Student may have the idea about resource sharing, multitasking, multiprocessing etc.

**UNIT-I**

**COMPUTER SYSTEM AND OPERATING SYSTEM OVERVIEW :** Overview of computer operating systems, operating systems functions, protection and security distributed systems, special purpose systems operating systems structures and systems calls, operating systems generation

**UNIT-II**

**PROCESS MANAGEMENT :** Process concepts threads, scheduling-criteria algorithms, their evaluation, Thread scheduling, case studies UNIX, Linux, Windows

**UNIT-III**

**CONCURRENCY :** Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples, atomic ransactions, Case studies UNIX, Linux, Windows.

**UNIT-IV**

**MEMORY MANAGEMENT :** Swapping, contiguous memory allocation, paging, structure of the page table ,segmentation, virtual memory, demand paging, page-Replacement, algorithms, case studies UNIX, Linux, Windows.

## UNIT-V

**PRINCIPLES OF DEADLOCK :** system model, deadlock characterization,deadlock prevention, detection and Avoidance, recovery form deadlock, I/O systems, Hardware, application interface, kernel I/O subsystem, Transforming I/O requests, Hardware operation, STREAMS, performance.

## UNIT-VI

**FILE SYSTEM INTERFACE :** The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection. File System implementation- File system structure, file system implementation, directory implementation, directory implementation, allocation methods, free-space management, efficiency and performance, case studies. UNIX, Linux, Windows

## UNIT-VII

**MASS-STORAGE STRUCTURE :** overview of Mass-storage structure, Disk structure, disk attachment disk scheduling, swap-space management, RAID structure, stable-storage implementation, Tertiary storage structure.

## UNIT-VIII

**PROTECTION :** Protection, Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language – Based Protection, Security- The Security problem, program threats, system and network threats cryptography as a security tool, user authentication, implementing security defenses, firewalling to protect systems and networks, computer–security classifications, case studies UNIX, Linux, Windows.

## TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne : Operating System Concepts, 7th Edition, John Wiley ,& Sons, 2006.
2. D.M.Dhamdhere : Operating systems - A Concept based Approach-, 2nd Edition, TMH, 2010.

## REFERENCES:

1. William Stallings : Operating Systems' – Internal and Design Principles, 6th Edition, Pearson education/PHI, 2009.
2. Charles Crowley : Operating Systems - A Design Approach-1st Edition, TMH, 2009.
3. Andrew S Tanenbaum : Modern Operating Systems, 3rd edition Pearson/PHI, 2008.

# SOFTWARE DEVELOPMENT ENGINEERING

(ELECTIVE -II)

**Course Code: ACS1114**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM :**

- The aim of this course is to provide general background on the Engineering of Software Development process to students in non computer science departments such as civil, chemical, mechanical, electrical engineering, etc.

**OBJECTIVES:**

- To provide an understanding of the various processes software engineers may employ in developing contemporary software systems
- To examine all phases of the software development life cycle, from initial planning through implementation and maintenance.
- To develop an understanding of the tools and techniques employed in contemporary software engineering.
- To develop an understanding of the skills required to analyze and design software systems.
- To demonstrate an appreciation of good practices in software engineering.
- To demonstrate the application of software quality concepts.

**UNIT-I**

**INTRODUCTION TO SOFTWARE ENGINEERING:** The evolving role of software, Changing Nature of Software, Software Myths.

**A GENERIC VIEW OF PROCESS: SOFTWARE ENGINEERING:** A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), process patterns, process assessment, personal and team process models.

**UNIT-II**

**PROCESS MODELS:** The waterfall model, Incremental process models, Evolutionary process Models, The Unified process, agile methodology.

**SOFTWARE REQUIREMENTS :** Functional and non-functional requirements, user requirements, System requirements, Interface specification, the Software Requirements document.

**UNIT-III**

**REQUIREMENTS ENGINEERING PROCESS :** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

**SYSTEM MODELS :** context models, Behavioral models, Data models, object models, structured Methods.

**UNIT-IV**

**DESIGN ENGINEERING :** Design process and Design quality, Design concepts, the design model.

**CREATING AN ARCHITECTURAL DESIGN :** Software Architecture, Data design, Architectural styles and

Patterns, Architectural Design.

**UNIT-V**

**OBJECT ORIENTED DESIGN :** Objects and Object classes, An Object Oriented design process,Design

Evolution.

**PERFORMING USER INTERFACE DESIGN:** Golden rules, User interface analysis and design, interface Analysis, interface design steps, Design evaluation,

**Unit-VI**

**TESTING STRATEGIES:** A strategic approach to software testing, the strategies for conventional

Software, Verification Testing and Validation Testing, Different Types of Testing, the art debugging.

## UNIT-VII

Client Server Systems - Meaning, Architecture and Design

Web based Systems - Meaning, Architecture and Design

Data warehouse System - Meaning, Architecture and Design

Introduction to RAD Tool ( 3-4 lab sessions included )

## UNIT-VIII

Write Software Development Specifications that include System Analysis and System design for

a) A Web Based Application System

b) A Data warehouse Application system

## TEXT BOOKS:

1. Rojer S Pressman, Roger S., Software Engineering, A Practitioner's Approach, 7th Edition, TMH, 2008.

2. Han, Jiawel and Kamber Micheline, Data Mining – Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publishers, 2008.

# RELIABILITY EVALUATION OF ENGINEERING SYSTEMS

(ELECTIVE - II)

**Course Code: AEE1125**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM :**

This is a basic course on Reliability in application to Engineering Systems in general. This course, as an elective can be taken by other branches also in general, by Mechanical, Chemical and Electronics and Communication branches in particulars.

**OBJECTIVE :**

The subject introduces concepts of reliability after reviewing concepts of Probability and Random Variables. The course is helpful in System Analysis and Design.

**UNIT-I**

**INTRODUCTION AND PRELIMINARIES :** Introduction to the subject, Review of basic Probability Theory: Probability concepts, Venn Diagrams, Combining Probabilities, Random Variables, distribution and Density Functions, Expectation, Variance, Standard Deviation, Binomial Distribution and properties.

**UNIT-II**

**NETWORK MODELING AND EVALUATION OF SIMPLE SYSTEMS:** Network Modeling Concepts, Series, Parallel and Series Parallel Systems, Redundant Systems.

**UNIT-III**

**NETWORK MODELING AND EVALUATION OF COMPLEX SYSTEMS :** Modeling and Evaluation, conditional Probability approach, Cutset Method, Tie-set Method, Connection Matix Techniques, Event trees, Fault trees, Failure Models.

**UNIT-IV**

**PROBABILITY DISTRIBUTION AND RELIABILITY EVALUATION :** Distribution concepts, General reliability functions and evaluation, Poisson, Normal and Exponential Distribution, Reliability functions, A-posteriori failure probability, Mean Value and standard deviation, Different other distributions , Data Analysis.

**UNIT-V**

**SYSTEM RELIABILITY EVALUATION USING PROBABILITY DISTRIBUTIONS :** Series and Parallel Systems, Partially Redundant and Systems, Mean Time to Failure, Standby Systems, Wear out and Component Reliability, Maintenance and Component Reliability.

**UNIT-VI**

**DISCRETE MARKOV CHAINS :** Modeling concepts, Stochastic transitional probability Matrix, Time dependant probability evaluation, Limiting State Probability Evaluation, Absorbing States, Applications.

**UNIT-VII**

**CONTINUOUS MARKOV CHAINS :** General Modeling Concepts, State Space diagrams, Stochastic Transitional Probability Matrix.

**UNIT-VIII**

**CONTINUOUS MARKOV CHAINS ( CONTINUED) :** Evaluating Limiting State Probabilities and Time dependant Sate Probabilities, Reliability Evaluation in Repairable Systems, Mean time to failure, Applications.

**TEXT BOOKS :**

1. Roy Billington, Ronald N. Allan, "Reliability Evaluation of Engineering Systems" (Concepts and Techniques) , 2nd edition Springer, 2010.

**REFERENCE BOOK :**

1. Charles Ebelling, "An Introduction to Reliability & Maintainability Engineering" Tata MC. Graw Hill Science, 1st edition, 2000.

# MICROWAVE & OPTICAL COMMUNICATIONS LAB

**Course code: AEC1134**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 2 |

## AIM AND OBJECTIVE:

The main objective of this lab is to gain the practical hands on experience by exposing the students to various microwave components and optical fibres. The students will have an understanding of the concepts involved in transmission and reception of the microwave signals, characteristics of components.

## MINIMUM TEN EXPERIMENTS TO BE CONDUCTED:

1. To verify Reflex Klystron Characteristics and to determine the frequency and tuning range of reflex klystron.
2. To verify Gunn Diode Characteristics.
3. To analyze the fixed and variable attenuator and plot the micrometer reading Vs attenuation.
4. To determine the coupling factors and directivity of directional coupler.
5. To measure the power distribution of various wave guide Tee i.e. E plane, Hplane, Magic Tee.
6. VSWR Measurement and load impedance calculations using smith chart.
7. Scattering parameters of Circulator.
8. Characterization of LED.
9. Characterization of Laser Diode.
10. Intensity modulation of Laser output through an optical fiber.
11. Measurement of Data rate for Digital Optical link.
12. Measurement of Numerical Aperture of fiber cable.
13. Measurement of losses for Analog Optical link.

# DIGITAL SIGNAL PROCESSING LABORATORY

**Course Code: AEC1135**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 2 |

## AIM & OBJECTIVE:

Design, Simulation and Implementation of various discrete time signals and verification of various digital signal processing operations using Code Composer Studio and MATLAB.

## LIST OF EXPERIMENTS:

1. To study the features and architecture of DSP chips – TMS 320C6713 DSK.
2. To verify linear convolution between two sequences.
3. To verify the circular convolution between two sequences.
4. Implementation of 4-point and 8-point FFT.
5. Implementation of 4-point and 8-point IFFT.
6. To generate various discrete time signals.
7. To generate sum of sinusoidal signals and to find the frequency response.
8. To find the FFT of given 1-D signal and plot.
9. To design IIR Butterworth and Chebyshev filters(LP/HP).
10. To design FIR filter (LP/HP) using windowing technique.

a) Using rectangular window

b) Using triangular window

c) Using hamming window

11. Filter Design and Analysis using FDA Tool.
12. To compute power density spectrum of a sequence.

*Note: Any **TEN** of the above experiments are to be conducted*

# *COURSE STRUCTURE & SYLLABI FOR VIII SEMESTER*

# VIII SEMESTER

| COURSE CODE | THEORY/LAB | L | T | P | C |
|---|---|---|---|---|---|
| AEC1136 | Computer Networks | 4 | 1 | 0 | 4 |
| | **Elective-III** | 4 | 1 | 0 | 4 |
| AEC1137 | Digital Design through Verilog | | | | |
| AEC1138 | Embedded Systems | | | | |
| AEC1139 | Industrial Electronics | | | | |
| | **Elective-IV** | 4 | 1 | 0 | 4 |
| AEC1140 | DSP Processors and Architecture | | | | |
| AEC1141 | Wireless Communications | | | | |
| AEE1112 | Power Electronics | | | | |
| AEC1142 | Process Control and Automation | | | | |
| AEC11SM | Seminar | | | | |
| AEC11CV | Comprehensive viva | - | - | - | 4 |
| AEC11PW | Project work | 0 | 0 | 9 | 12 |
| | **Total** | **12** | **3** | **12** | **30** |

# COMPUTER NETWORKS

**Course Code: AEC1136**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To understand data networks applications, protocols and applications for design of all generation data networks.

**OBJECTIVE:**

Capability to understand updated technologies for future applications.

**UNIT-I**

**INTRODUCTION :** OSI, TCP/IP and other networks models, Examples of Networks, Arpanet, Internet, Network Topologies, PAN ,LAN,MAN,WAN.

**UNIT-II**

**PHYSICAL LAYER :** Transmission media: copper twisted pair, Optical Fiber, wireless: switching and encoding, asynchronous communications; Narrow band, broad band ISDN and ATM.

**UNIT-III**

**DATA LINK LAYER :** Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window, Slip, Data link layer in HDLC, Internet, ATM.

**UNIT-IV**

**MEDIUM ACCESS SUB LAYER :** ALOHA, MAC addresses, Carrier sense multiple access, IEEE 802.X Standard Ethernet, wireless LANS. Bridges.

**UNIT-V**

**NETWORK LAYER :** Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broadcast, Multi cast, distance vector routing.

**UNIT-VI**

**DYNAMIC ROUTING :** Broadcast routing, Rotary for mobility, Congestion, Control Algorithms – General Principles of Congestion prevention policies, Internet working: The Network layer in the internet and in the ATM Networks.

**UNIT-VII**

**TRANSPORT LAYER :** Transport Services, Connection management, TCP and UDP protocols; ATM, AAL Layer Protocol.

**UNIT-VIII**

**APPLICATION LAYER :** Network Security, Domain name system, SNMP, Electronic Mail; the Worldwide WEB.

**TEXT BOOKS:**

1. Andrew S Tanenbaum, "Computer Networks" 4th Edition. Pearson, Education/PHI,2003.
2. Behrouz A. Forouzan., "Data Communications and Networking" Third Edition TMH.

**REFERENCES:**

1. S.Keshav, "An Engineering Approach to Computer Networks: ATM networks, the internet, and the telephone network", Pearson Education India, 1997,2nd Edition.
2. W.A.Shay, "Understanding communications and networks", PWS, 1995.

# DIGITAL DESIGN THROUGH VERILOG

(ELECTIVE – III)

**Course Code: AEC1137**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

## AIM AND OBJECTIVES:

To learn the concepts of modeling a digital system using Verilog hardware description Language.

## UNIT-I

**INTRODUCTION TO VERILOG :** Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools, Test Benches.

**LANGUAGE CONSTRUCTS AND CONVENTIONS:** Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Memory, Operators, System Tasks.

## UNIT-II

**GATE LEVEL MODELING :** Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flipflops with Gate Primitives, Delays, Strengths and Contention Resolution, Net Types, Design of Basic Circuits.

## UNIT-III

**BEHAVIORAL MODELING :** Introduction, Operations and Assignments, Functional Bifurcation, *Initial* Construct, *Always* Construct, Examples, Assignments with Delays, *Wait* construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non blocking Assignments, The case statement, Simulation Flow. i*f* and i*f*-else constructs, assign-deassign construct, repeat construct, for loop, the

disable construct, whileloop, forever loop, parallel blocks, force-release construct, Event.

**UNIT-IV**

**MODELING AT DATA FLOW LEVEL :** Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators.

**SWITCH LEVEL MODELING :** Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets.

**UNIT-V**

**SYSTEM TASKS, FUNCTIONS AND COMPILER DIRECTIVES :** Introduction, Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Compiler Directives, Hierarchical Access, General Observations.

**FUNCTIONS, TASKS, AND USER-DEFINED PRIMITIVES:** Introduction, Function, Tasks, User- Defined Primitives (UDP), FSM Design (Moore and Mealy Machines).

**UNIT-VI**

**DIGITAL DESIGN WITH SM CHARTS :** State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative realizations for SM Charts using Microprogramming, Linked State Machines.

**UNIT-VII**

**DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES :** Xilinx 3000 Series FPGAs, Designing with FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices (CPLDs), Altera FLEX 10K Series CPLDs.

**UNIT-VIII**

**VERILOG MODELS :** Static RAM Memory, A simplified 486 Bus Model, UART Design.

## TEXT BOOKS :

1. T.R. Padmanabhan and B. Bala Tripura Sundari, "Design through Verilog HDL'' WSE, IEEE Press2004.
2. Charles H.Roth, "Digital System Design using VHDL",Jr. Thomson publications,2004.

## REFERENCES :

1. Samir Palnitkar, "Verilog HDL" ,Pearson education, 2nd edition,2003.
2. Thomas and Moorby," The Verilog Hardware Description Language", kluwer academic publishers 5th edition,2002.
3. Stephen Brown and Zvonko Vranesic," Fundamentals of Logic Design with Verilog", TMH publications, 2005.
4. J. Bhaskar, ''A Verilog Primer'', BSP, 2003.

# EMBEDDED SYSTEMS

(ELECTIVE – III)

**Course Code: AEC1138**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To familiarize student with the various hardware and software technologies used in the embedded system design.

**OBJECTIVES:**

1. To provide overview of embedded systems and their design challenges and digital design of single and general purpose processors.
2. To introduce advanced state machine models popular in embedded system modeling and various communication interfaces.
3. To introduce RTOS concepts with reference to task synchronization in embedded systems
4. To discuss hardware/software codesign, synthesis and design based on intellectual property and implementation of digital camera with practical orientation.

**UNIT-I**

**INTRODUCTION :** Embedded systems overview, design challenge, processor technology, IC technology, Design Technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors.

**UNIT-II**

**GENERAL PURPOSE PROCESSORS:** Basic architecture, operation, Pipelining, Programmer's view, development environment, Application Specific Instruction-Set Processors (ASIPs) , Microcontrollers and Digital Signal Processors.

**UNIT-III**

**STATE MACHINE AND CONCURRENT PROCESS MODELS:** Introduction, models Vs. languages, finite state machines with data path model (FSMD), using state machines, program state machine model (PSM), concurrent process model, concurrent processes, communication among processes, synchronization among processes, implementation, data flow model, real-time systems.

**UNIT-IV**

**COMMUNICATION INTERFACE :** Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth, Serial Peripheral Interface

**UNIT-V**

**EMBEDDED / RTOS CONCEPTS :** Architecture of the Kernel, Tasks and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message Queues, Event Registers, Pipes, Signals

**UNIT-VI**

**EMBEDDED / RTOS CONCEPTS :** Timers, Memory Management, Priority inversion problem, Embedded operating systems, Embedded Linux, Real-time operating systems, RT Linux, Handheld operating systems, Windows CE.

**UNIT-VII**

**DIGITAL CAMERA EXAMPLE :** Introduction, Introduction to a Simple Digital Camera, Requirement Specification, Design

**UNIT-VIII**

**DESIGN TECHNOLOGY :** Introduction, Automation, Synthesis, Parallel evolution of compilation and synthesis, Logic Synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/ Software Co-Design, Verification, Hardware/Software co-simulation, Reuse of intellectual property codes.

## TEXT BOOKS :

1. Raj Kamal, “Introduction to Embedded Systems” , TMH, 2002.
2. Frank Vahid, Tony D. Givargis,”Embedded System Design A Unified Hardware/Software Introduction - John Wiley, 2002.
3. KVKK Prasad , “Embedded / Real Time Systems ,” Dreamtech Press, 2005.

## REFERENCES :

1. Jonathan W. Valvano , “Embedded Microcomputer Systems: Real time Interfacing “ 3rd ed.,Brooks Cole, 2011
2. David E. Simon, “An Embedded Software Primer”, Pearson Ed., 2005.
3. Sri Ram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming” , TMH, 2004.

# INDUSTRIAL ELECTRONICS

(ELECTIVE – III)

**Course code : AEC1139**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To familiarize students with the electronics associated with industries for the improvement of quality and productivity.

**OBJECTIVE:**

To make students aware of

- nomenclature
- notations
- existing standard practices
- the developments of industrial automation over a number of years.

**UNIT-I**

**POWER SUPPLIES :** DC-DC Converters, Block diagram, Design Parameters, Power loss, Power dissipation, Accuracy, Resolution, Principle of MTBF.

**UNIT-II**

**TRANSDUCERS :** Introduction : Classification of Transducers, selection criteria of a Transducer, Types of Transducers, Strain gauge as a transducer, Capacitive Transducer, Inductive Transducer, Piezoelectric Transducers, Thermistors, Thermocouples, Pyrometers, Accelerometers.

**UNIT-III**

**ANALOG TRANSMITTERS :** Transmitters in Instrumentation and Control systems, 0-5V, 0-10V, 0-20mA, 4-20mA output Analog Transmitters.

**UNIT-IV**

**DIGITAL TRANSMITTERS :** RS232, RS485, SPI, USB, Serial Synchronous Interface (SSI) Digital Transmitters.

**UNIT-V**

**DISTRIBUTED MANAGEMENT SYSTEMS :** Evolution, Different architectures, Local Control Unit, Operator Interface, Displays, Engineering Interface, Alarms and Alarm management, DCS case study, Study of any one popular DCS available in market, Factors to be considered in selecting DCS, case studies in DCS.

**UNIT-VI**

**PLCs-I :** Introduction: PLC Definition, Advantages, Characteristic function of a PLC, Evolution of PLC, Types of PLC, Elements of functional Block diagram of PLC.

**UNIT-VII**

**PLCs-II :** Basic design of a PLC, Areas of Application of PLC, Programming of a PLC – Resources of a PLC, Elements of Ladder diagram.

**UNIT-VIII**

**INDUSTRIAL APPLICATIONS:** Digital Shaft encoder, Pyrometer, Roll gap adjustment, Furnace Heat Control, Rolling Schedules, Supervisory Control and Data Acquisition (SCADA) systems: case studies.

**TEXT BOOKS:**

1. S K Bhattacharya, S Chatterjee, "Industrial Electronics and Control", TMH Publishing company Limited, 2002.
2. Helen Beecroft, Jim Cahill, "Fundamentals of Industrial Control-Distributed Control Systems/Digital Automation Systems", ISA Publishers.
3. David Bailey, Edwin Wright , "Practical SCADA for Industry'', Newnes publications, 2003.

## REFERENCES :


1. R. Bliesener, F. Ebel, C. Loffler, B. Plagemann, H. Regber, E.V.Terzi, A. Winter, TP301.Festo Didactic.,08/2002 edition.
2. http://en.wikipedia.org/wiki/List_of_PLC_manufacturers.
3. David Bailey, Edwin Wright , "Practical SCADA for Industry" Newnes publications, 2003.
4. John W. Webb, Ronald A. Reis, "Programmable logic controllers: principles and applications", Prentice Hall, 2003.
5. Madhuchhandra Mitra and Samarjit Sen Gupta, "Programmable Logic Controllers And Industrial Automation", Penram International Publishing (India) Pvt.Ltd.

# DSP PROCESSOR AND ARCHITECTURE

(ELECTIVE – IV)

**CODE: AEC1140**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

This course aims to introduce the architechture required for Signal Processing applications with practical implementation issues. The necessary interaction between hardware and software, architecture issues will be studied in the context of TMS320C54XX DSP Processor.

**OBJECTIVES:**

1. To understand the issues involved in implementing DSP algorithms on processors.
2. To understand and appreciate the features provided by various architectures in supporting common DSP tasks.
3. To understand the implementation of common DSP tasks on processors.

**UNIT-I**

**INTRODUCTION TO DIGITAL SIGNAL PROCESING:**

Introduction, Digital signal-processing system, Sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

**UNIT-II**

**COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS :**

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

**UNIT-III**

**ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES:** Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

**UNIT-IV**

**EXECUTION CONTROL AND PIPELINING:** Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

**UNIT-V**

**PROGRAMMABLE DIGITAL SIGNAL PROCESSORS :** Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

**UNIT-VI**

**IMPLEMENTATIONS OF BASIC DSP ALGORITHMS :** The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

**UNIT-VII**

**IMPLEMENTATION OF FFT ALGORITHMS :** An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

**UNIT-VIII**

**INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES:** Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

Multichannel buffered serial port (McBSP), McBSP Programming, CODEC interface circuit, CODEC programming, CODEC-DSP interface example.

**TEXT BOOKS:**

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

**REFERENCES:**

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

# WIRELESS COMMUNICATIONS

(ELECTIVE – IV)

**Course Code: AEC1141**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To Study the Wireless Communication Techniques, Channel Properties and Standards of Wireless Systems.

**OBJECTIVE:**

Familiar about methods to improve the capacity of the Wireless Communications.

**UNIT-I**

**INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS :** Evolution of Mobile Radio Communications, Mobile radio telephony in the U.S., Mobile radio systems around the world, Examples of Wireless Communication systems, Trends in cellular radio and Personal Communications, Second generation (2G) Cellular Networks, Third generation (3G) Wireless Networks, Wireless Local Loop (WLL) and LMDS, Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks(PANs).

**UNIT-II**

**THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS :** Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems.

**UNIT-III**

**MOBILE RADIO PROPAGATION :** Three Basic Propagation Mechanisms, Reflection, Diffraction, Scattering, Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading, Fading in Wireless Communications.

**UNIT-IV**

**MODULATION TECHNIQUES FOR MOBILE RADIO :** Frequency Modulation vs. Amplitude Modulation, Amplitude Modulation, Angle Modulation, Digital Modulation-an Overview, Line Coding, Pulse Shaping Techniques, Geometric Representation of Modulation signals, Linear Modulation Techniques, Constant Envelope Modulation, Combined Linear and Constant Envelope Modulation Techniques, Spread Spectrum Modulation Techniques, Modulation performance in Fading and Multipath channels.

**UNIT-V**

**EQUALIZATION, DIVERSITY, CHANNEL CODING, AND BASEBAND CODING :** Fundamentals of Equalization, Generic Adaptive Equalizer, Equalizers in a Communications Receiver, Survey of Equalization Techniques, Linear Equalizers, Nonlinear Equalization, Algorithms for Adaptive Equalization, Fractionally Spaced Equalizers, Diversity Techniques, RAKE Receiver, Interleaving, Channel Coding, Block Codes and Finite Fields, Convolutional Codes, Coding gain, Trellis Coded Modulation, Turbo Codes, Characteristics of Speech Signals, Quantization Techniques, PCM, Differential Pulse Code Modulation(DPCM), Delta Modulation (DM), Adaptive Delta Modulation(ADM), Frequency Domain Coding of Speech, Vocoders, Linear Predictive Coders, Choosing Speech Codecs for Mobile Communications, GSM Codec, USDC Codec, Performance evolution of Speech Coders.

**UNIT-VI**

**MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATIONS :** Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, CDMA (Code Division Multiple Access) Space Division Multiple Access (SDMA), Packet Radio, Capacity of Cellular Systems.

**UNIT-VII**

**WIRELESS NETWORKING :** Difference Between Wireless and Fixed Telephone Networks, Development of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks, Wireless

Data Services, Common Channel Signaling(CCS), Integrated Services Digital Network(ISDN), Signaling System No.7(SS7), Example of SS7-Global Cellular Network Interoperability, Personal Communication Services/Networks(PCS/PCNs), Protocols for Network Access, Network Databases, Universal Mobile Telecommunication Systems(UMTS).

**UNIT-VIII**

**WIRELESS SYSTEMS AND STANDARDS :** Global Systems for Mobile(GSM), CDMA Digital Cellular Standard(IS-95), PACS-Personal Access Communication Systems, Pacific Digital Cellular(PDC), System(PHS), US PCS and ISM Bands, US Wireless Cable Television, 2G and 3G Network Applications.

**TEXT BOOKS:**

1. Wireless Communications-Theodore, S.Rappaport, Pearson education, 2nd Edn., 2002.
2. Mobile Cellular Telecommunications-W.C.Y.Lee, Tata McGraw Hill, 2nd edition, 2006.

**REFERENCES:**

1. Andrea Gold smith, " Wireless Communications" Cambridge University Press, 2005
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
3. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.
4. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

# POWER ELECTRONICS

(ELECTIVE – IV)

**Course Code: AEE1112**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 4 |

**AIM:**

To familiarize the student with different power semiconductor devices, converter circuits that find wide application in industry.

**OBJECTIVE:**

With the advent of semiconductor devices, revolution is taking place in the power transmission, distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters and their analysis.

**UNIT-I**

**POWER SEMICONDUCTOR DEVICES :** Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics– Basic principle of operation of SCR – Static characteristics – Two transistor analogy of SCR - Turn on and turn off methods- Dynamic characteristics of SCR – Turn on and Turn off times -Salient points .

**UNIT-II**

**TRIGGERING AND COMMUTATION CIRCUITS :** Series and parallel connections of SCR's – Thyristor Protection-di/dt protection-dv/dt protection-over voltage protection-over current protection-gate protection-(Principle of operation only)– Specifications and Ratings of SCR - Gate triggering circuits, Line Commutation and Forced Commutation circuits- Numerical problems.

**UNIT-III**

**SINGLE PHASE FULLY CONTROLLED CONVERTERS:** Fully controlled converters, Mid point and Bridge connections with Resistive, RL loads and RLE load– Derivation of average load voltage and current

for continuous load current only– Effect of freewheeling diode- Line commutated inverters -Active and Reactive power inputs to the converters without and with Freewheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numerical problems.

**UNIT-IV**

**SINGLE PHASE HALF CONTROLLED CONVERTERS :** Half controlled bridge converter with R, RL and RLE load- Derivation of average load voltage and current for continuous load current operation only-Active and Reactive power inputs to the converters–Numerical problems

**UNIT-V**

**THREE PHASE LINE COMMUTATED CONVERTERS** : Three phase converters – Three pulse and six pulse converters – Mid point and bridge connections- derivation of average load voltage With R and RL loads-Three phase half controlled bridge converter-derivation of average load voltage – Effect of Source inductance–Dual converters (both single phase and three phase) - Numerical Problems.

**UNIT-VI**

**AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS:** AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads, Derivation of RMS load voltage, current and power factor -wave forms –numerical problems - Cyclo converters – Single phase mid point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms

**UNIT-VII**

**CHOPPERS :** Choppers – Time ratio control and Current limit control strategies – Step down choppers- Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage Expression ,Morgan's chopper, Jones chopper (Principle of operation only) Waveforms — AC Chopper – Problems.

**UNIT-VIII**

**INVERTERS :** Inverters – Single phase inverter – Basic series inverter

– Basic parallel Capacitor inverter, Bridge inverter – Waveforms - Voltage control techniques for inverters -Pulse width modulation techniques.

## TEXT BOOKS:

1. M. D. Singh & K. B. Kanchandhani, Power Electronics, Tata Mc Graw – Hill Publishing company, 2nd Edition, 1998.
2. P. S. Bimbra, Power Electronics, Khanna Publishers, 4th Edition, 2000.

## REFERENCES:

1. M. H. Rashid, Power Electronics: Circuits, Devices and Applications, Prentice Hall of India 2nd Edition, 1998.
2. P.C.Sen, Power Electronics, Tata Mc Graw-Hill, 1st Edition, 2001.
3. Vedam Subramanyam, Power Electronics, New Age International (P) Limited, Publishers, 2003.
4. B. K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, 2nd Edition, 2003.

# PROCESS CONTROL AND AUTOMATION

(ELECTIVE – IV)

**Course Code: AEC1142**

| L | T | P | C |
|---|---|---|---|
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**AIM:**

To familiarize engineers of all disciplines with the knowledge of computers and electronics.

**OBJECTIVES :**

1. To make a student comprehensive engineer.
2. To make the student understand the importance of automation and control for improvement of quality and productivity.
3. This knowledge should make every engineer to understand the importance ofproper specifications to be defined for making the automation successful.

**UNIT-I**

**INTRODUCTION TO COMPUTER CONTROL :** Role of computers in the control of Industrial processes (plants). Elements of Computer Controlled Process Plant. Classification – Batch, Continuous, Supervisory and Direct Digital Controls, Architecture – Centralized, Distributed and Hierarchical Systems, Man Machine or Human Computer Interface (HCI).

**UNIT-II**

**BUILDING BLOCKS :** Process Control Requirements of Computers, Process related variables, Computer Network, Communications in Distributed control Systems, Smart Sensors and Field bus, Wireless sensor networks and control, Data Acquisiton system.

**UNIT-III**

**CONTROL SYSTEM DESIGN :** Control System Design – Heuristics, Structural Controllability and Relative Gain Array. Controller Design –

Regulator design and other design considerations, Controller Tuning – P, PI, PID, and Ziegler-Nicholas method, Computer aided Control System Design.

**UNIT-IV**

**PROGRAMMABLE LOGIC CONTROLLERS (PLCS):** Introduction - principles of operation - Architecture of Programmable Logic controllers - programming the programmable controllers- software - configurations - applications.

**UNIT-V**

**DESIGN OF FEED FORWARD CONTROLLER :** Block Diagram, Feed Forward control algorithms – dynamic, static, Deadbeat

**UNIT-VI**

**CASCADE, PREDICTIVE AND ADAPTIVE CONTROL:** Cascade Control – Dynamic response, Types, Implementation, Predictive Control – Model based and Multivariable System, Adaptive Control – Adjustment, Schemes, and Techniques.

**UNIT-VII**

**INDUSTRIAL CONTROL APPLICATIONS:** Automation of thermal power plant - Automation strategy - distributed system structure - Automatic boiler controller - diagnostic function and protection - automatic start-up system - thermal stress control - man - machine interface – software system - communication system - variable pressure control - combined plant control.

**UNIT-VIII**

**DISTRIBUTED CONTROL SYSTEMS:** Introduction - Functional requirements of distributed control system - system architecture -

Distributed control systems - configuration - Applications of distributed control systems.

**TEXT BOOKS**

1. S.K.Singh, " Computer Aided Process Control", PHI Learning Pvt. Ltd., 2004.

2. M.Chidambaram, “Computer Control of Processes “, Narosa 2003.

**REFERENCES:**

1. Seborg, D.E., T.F. Edgar, and D.A. Mellichamp, Process Dynamics and Control, John Wiley, 2004.
2. Johnson D Curtis, Instrumentation Technology, (7th Edition) Prentice Hall India, 2002.
3. Computer-based Industrial Control by Krishna Kanth. PHI 1997.
4. Real Time Control : An Introduction – Second Edition, S. Bennett, Pearson Education India, 2003 Reference http: // jntu.ac.in/dap/syl.html.