

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING  
III YEAR COURSE STRUCTURE & SYLLABUS (R16)****Applicable From 2016-17 Admitted Batch****III YEAR I SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	EC501PC	Electromagnetic Theory and Transmission Lines	4	1	0	4
2	EC502PC	Linear and Digital IC Applications	4	0	0	4
3	EC503PC	Digital Communications	4	1	0	4
4	SM504MS	Fundamentals of Management	3	0	0	3
5		Open Elective – I	3	0	0	3
6	EC505PC	Linear IC Applications Lab	0	0	3	2
7	EC506PC	Digital IC Applications Lab	0	0	3	2
8	EC507PC	Digital Communications Lab	0	0	3	2
9	*MC500HS	Professional Ethics	3	0	0	0
		<b>Total Credits</b>	<b>21</b>	<b>2</b>	<b>9</b>	<b>24</b>

**III YEAR II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1		Open Elective-II	3	0	0	3
2		Professional Elective-I	3	0	0	3
3	EC601PC	Antennas and Wave Propagation	4	0	0	4
4	EC602PC	Microprocessors and Microcontrollers	4	0	0	4
5	EC603PC	Digital Signal Processing	4	0	0	4
6	EC604PC	Digital Signal Processing Lab	0	0	3	2
7	EC605PC	Microprocessors and Microcontrollers Lab	0	0	3	2
8	EN606HS	Advanced English Communication Skills Lab	0	0	3	2
		<b>Total Credits</b>	<b>18</b>	<b>0</b>	<b>9</b>	<b>24</b>

**During Summer Vacation between III and IV Years: Industry Oriented Mini Project**

**Professional Elective – I**

EC611PE	Computer organization and operating system
EC612PE	Digital Image Processing
EC613PE	Spread Spectrum Communications
EC614PE	Digital system Design

**\*Open Elective** subjects' syllabus is provided in a separate document.

**\*Open Elective** – Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.

**Ex:** - A Student of Mechanical Engineering can take Open Electives from all other departments/branches except Open Electives offered by Mechanical Engineering Dept.

## ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

**B.Tech. III Year I Sem.**  
**Course Code: EC501PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
4	1	0	4

### Course Objectives:

This is a structured foundation course, dealing with concepts, formulations and applications of Electromagnetic Theory and Transmission Lines, and is the basic primer for all electronic communication engineering subjects. The main objectives of the course are

- To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve physics and engineering problems.
- To distinguish between static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
- To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
- To conceptually understand the UPW Polarization features and Poynting Theorem, and apply them for practical problems.
- To determine the basic Transmission Line Equations and telephone line parameters and estimate the distortions present.
- To understand the concepts of RF Lines and their characteristics, Smith Chart and its applications, acquire knowledge to configure circuit elements, QWTs and HWTs, and to apply the same for practical problems.

**Course Outcomes :** Having gone through this foundation course, the students would be able to

- Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions, and use them for solving engineering problems.
- Analyze the Wave Equations for good conductors and good dielectrics, and evaluate the UPW Characteristics for several practical media of interest.
- Establish the proof and estimate the polarization features, reflection and transmission coefficients for UPW propagation, distinguish between Brewster and Critical Angles, and acquire knowledge of their applications.
- Determine the Transmission Line parameters for different lines, characterize the distortions and estimate the characteristics for different lines.
- Analyze the RF Line features and configure them as SC, OC Lines, QWTs and HWTs, and design the same for effective impedance transformation.
- Study the Smith Chart profile and stub matching features, and gain ability to practically use the same for solving practical problems.

**UNIT – I**

**Electrostatics:** Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

**UNIT – II**

**Magnetostatics:** Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Illustrative Problems.

**Maxwell's Equations (Time Varying Fields):** Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems .

**UNIT – III**

**EM Wave Characteristics - I:** Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

**EM Wave Characteristics – II:** Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem – Applications, Illustrative Problems.

**UNIT – IV**

**Transmission Lines - I:** Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading, Illustrative Problems.

**UNIT – V**

**Transmission Lines – II:** Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements;  $\lambda/4$ ,  $\lambda/2$ ,  $\lambda/8$  Lines – Impedance Transformations, Significance of  $Z_{\min}$  and  $Z_{\max}$ , Smith Chart – Configuration and Applications, Single Matching, Illustrative Problems.

**TEXT BOOKS:**

1. Principles of Electromagnetics – Matthew N.O. Sadiku and S.V. Kulkarni, 6<sup>th</sup> Ed., Oxford University Press, Asian Edition, 2015.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2<sup>nd</sup> Ed. 2000, PHI.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

**REFERENCE BOOKS:**

1. Engineering Electromagnetics – Nathan Ida, 2<sup>nd</sup> Ed., 2005, Springer (India) Pvt. Ltd., New Delhi.
2. Networks, Lines and Fields – John D. Ryder, 2<sup>nd</sup> Ed., 1999, PHI.
3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 7<sup>th</sup> Ed., 2006, MC GRAW HILL EDUCATION.

## LINEAR AND DIGITAL IC APPLICATIONS

**B.Tech. III Year I Sem.**  
**Course Code: EC502PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### Course Objectives:

1. The main objectives of the course are:
2. To introduce the basic building blocks of linear integrated circuits.
3. To teach the linear and non - linear applications of operational amplifiers.
4. To introduce the theory and applications of analog multipliers and PLL.
5. To teach the theory of ADC and DAC.
6. To introduce the concepts of waveform generation and introduce some special function ICs.
7. To understand and implement the working of basic digital circuits

**Course Outcomes:** On completion of this course, the students will have:

1. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Understanding of the different families of digital integrated circuits and their characteristics.
3. Also students will be able to design circuits using operational amplifiers for various applications.

### UNIT - I

**Operational Amplifier:** Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

### UNIT - II

**Op-Amp, IC-555 & IC 565 Applications:** Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Saw tooth, Square Wave, IC555 Timer - Functional Diagram, Monostable, and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

### UNIT - III

**Data Converters:** Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

**UNIT - IV**

**Digital Integrated Circuits:** Classification of Integrated Circuits, Comparison of Various Logic Families Combinational Logic ICs – Specifications and Applications of TTL-74XX & Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

**UNIT - V**

**Sequential Logic IC's and Memories:** Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

**TEXT BOOKS:**

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8<sup>th</sup> Edition, 2005.

**REFERENCE BOOKS:**

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2<sup>nd</sup> Ed., 2003.
2. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore, Cengage Learning/ Jaico, 2009.
3. Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson, 2009.
4. Linear Integrated Circuits and Applications – Salivahanan, MC GRAW HILL EDUCATION.
5. Modern Digital Electronics – RP Jain – 4/e – MC GRAW HILL EDUCATION, 2010.

## DIGITAL COMMUNICATIONS

**B.Tech. III Year I Sem.**  
**Course Code: EC503PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

### Course Objectives:

- To understand the functional block diagram of Digital communication system.
- To understand the need for source and channel coding.
- To study various source and channel coding techniques.
- To understand a mathematical model of digital communication system for bit error rate analysis of different digital communication systems.

**Course Outcomes:** At the end of the course, the student will be able to:

- Understand basic components of Digital Communication Systems.
- Design optimum receiver for Digital Modulation techniques.
- Analyze the error performance of Digital Modulation Techniques.
- Understand the redundancy present in Digital Communication by using various source coding techniques.
- Know about different error detecting and error correction codes like block codes, cyclic codes and convolution codes.

### UNIT - I

**Elements of Digital Communication Systems:** Model of Digital Communication Systems, Digital Representation of Analog Signal, Certain Issues in Digital Transmission, Advantages of Digital Communication Systems, Sampling Theorem, Types of Sampling – Impulse Sampling, Natural Sampling, Flat – Top Sampling. Introduction to Baseband Sampling.

**Waveform Coding Techniques:** PCM Generation and Reconstruction, Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

### UNIT - II

Information theory: Information and Entropy, Conditional Entropy and Redundancy, Shannon-Fano Coding Mutual information, Information Loss due to Noise, Source coding- Huffman Code, Variable Length Coding, Lempel-ziv coding, Source coding to increase average information per bit, Lossy Source coding, Bandwidth-S/N Trade off, Hartley Shannon Law.

#### Error Control Codes

**Linear Block Codes:** Matrix Description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes. **Cyclic Codes:** Algebraic Structure, Encoding, Syndrome Calculation, Decoding. **Convolution Codes:** Encoding, Decoding,



**UNIT - III**

**Baseband Pulse Transmission:** Introduction, Matched Filter, Error Rate Due to Noise, intersymbol interference Nyquist's criterion for Distortionless Baseband Binary Transmission, Correlative -Level Coding Baseband M-Array PAM Transmission PAM Transmission, Digital subscriber Lines, Optimal Liner Receiver, Adaptive Equalization, Eye patterns.

**Digital pass band transmission:** pass band transmission model, Gram-Schmidt orthogonalization procedure, Geometric interpretation of signals Coherent detection of signals in noise, probability of error, Correlation receiver.

**UNIT - IV**

**Digital Modulation Techniques:** Introduction, ASK, ASK Modulator, Coherent ASK Detector, Non-Coherent ASK Detector, FSK, Bandwidth and Frequency Spectrum of FSK, Non Coherent FSK Detector, Coherent FSK Detector, FSK Detection using PLL, BPSK, Coherent PSK Detection, QPSK, 8-PSK, 16-PSK Differential PSK, QAM .

**UNIT - V**

**Spread Spectrum Modulation:** Use of Spread Spectrum, Direct Sequence Spread (DSSS), and Code Division Multiple Access, Ranging using DSSS, Frequency Hopping Spread Spectrum, PN - Sequence: Generation and characteristics, Synchronization in Spread Spectrum Systems.

**TEXT BOOKS:**

1. Communications system, S. Haykin, Wiley, 4 edition 2009.
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.

**REFERENCES:**

1. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008
2. Electronic communication systems, Wayne Tomasi, 5 edition, Pearson
3. Communication Systems: Analog and Digital, R. P. Singh , S. Sapre, McGraw-Hill Education, 2012
4. Digital Communications – John G. Proakis , Masoud Salehi – 5th Edition, McGraw-Hill, 2008.

## FUNDAMENTALS OF MANAGEMENT

**B.Tech. III Year I Sem.**  
**Course Code: SM504MS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objective:** To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills.

**Course Outcome:** The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

### UNIT - I

**Introduction to Management:** Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

### UNIT - II

**Planning and Decision Making:** General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

### UNIT - III

**Organization and HRM:** Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.

Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

### UNIT - IV

**Leading and Motivation:** Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership.

Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

**UNIT - V**

**Controlling:** Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

**TEXT BOOKS:**

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

**REFERENCES:**

1. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

**LINEAR IC APPLICATIONS LAB**

**B.Tech. III Year I Sem.**  
**Course Code: EC505PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**Note:**

- To perform any twelve experiments
- Verify the functionality of the IC in the given application.

**Design and Implementation of:**

1. Inverting and Non-inverting Amplifiers using Op Amps.
2. Adder and Subtractor using Op Amp.
3. Comparators using Op Amp.
4. Integrator Circuit using IC 741.
5. Differentiator circuit using Op Amp.
6. Active Filter Applications – LPF, HPF (first order)
7. IC 741 Waveform Generators – Sine, Square wave and Triangular waves.
8. Mono-stable Multivibrator using IC 555.
9. Astable Multivibrator using IC 555.
10. Schmitt Trigger Circuits – using IC 741.
11. IC 565 – PLL Applications.
12. Voltage Regulator using IC 723.
13. Three Terminal Voltage Regulators –7805, 7809, 7912.

**DIGITAL IC APPLICATIONS LAB**

**B.Tech. III Year I Sem.**  
**Course Code: EC506PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**Note:**

- To perform any twelve experiments
- Verify the functionality of the IC in the given application.

**Design and Implementation of:**

1. Design a 16 x 4 priority encoder using two 8 x 3 priority encoder.
2. Design a 16 bit comparator using 4 bit Comparators.
3. Design a model to 53 counter using two decade counters.
4. Design a 450 KHz clock using NAND / NOR gates.
5. Design a 4 bit pseudo random sequence generator using 4 – bit ring counter.
6. Design a 16 x 1 multiplexer using 8 x 1 multiplexer.
7. Design a 16 bit Adder / Subtractor using 4 – bit Adder / Subtractor IC's
8. Plot the transform Characteristics of 74H, LS, HS series IC's.
9. Design a 4 – bit Gray to Binary and Binary to Gray Converter.
10. Design a two Digit 7 segment display unit using this display the Mod counter output of experiment 3.
11. Design an 8 bit parallel load and serial out shift register using two 4 bit shift register.
12. Design an 8 bit Serial in and serial out shift register using two 4 bit shift register.
13. Design a Ring counter and Twisted ring counter using a 4-bit shift register
14. Design a 4 digit hex counter using synchronous one digit hex counters.
15. Design a 4 digit hex counter using Asynchronous one digit hex counters.

**DIGITAL COMMUNICATIONS LAB**

**B.Tech. III Year I Sem.**  
**Course Code: EC507PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**Note:**

- Perform any twelve experiments.
- Hardware Testing to be done

**List of Experiments:**

1. PCM Generation and Detection
2. Differential Pulse Code Modulation
3. Delta Modulation
4. Adaptive Delta modulation
5. Time Division Multiplexing of 2 Band Limited Signals
6. Frequency Shift Keying: Generation and Detection
7. Phase Shift Keying: Generation and Detection
8. Amplitude Shift Keying: Generation and Detection
9. Study of the spectral characteristics of PAM
10. Study of the spectral characteristics of PWM
11. Study of the spectral characteristics of QAM.
12. DPSK :Generation and Detection
13. QPSK : Generation and Detection
14. OFDM: Generation and Detection

## PROFESSIONAL ETHICS

**B.Tech. III Year I Sem.**  
**Course Code: MC500HS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Course Objective:** To enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and Professional lives.

**Course Outcome:** The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

### UNIT - I

**Introduction to Professional Ethics:** Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

### UNIT - II

**Basic Theories:** Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

### UNIT - III

**Professional Practices in Engineering:** Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession.

Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

### UNIT - IV

Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation.

Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

**UNIT - V**

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

**TEXT BOOKS:**

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

**REFERENCES**

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.



**COMPUTER ORGANIZATION AND OPERATING SYSTEMS**  
(Professional Elective – I)

**B.Tech. III Year II Sem.**  
**Course Code: EC611PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:** The course objectives are

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.
- To study the hierarchical memory system including cache memories and virtual memory.
- To demonstrate the knowledge of functions of operating system memory management scheduling, file system and interface, distributed systems, security and dead locks.
- To implement a significant portion of an Operating System.

**Course Outcomes:** Upon completion of the course, students will have thorough knowledge about:

- Basic structure of a digital computer
- Arithmetic operations of binary number system
- The organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.
- Operating system functions, types, system calls.
- Memory management techniques and dead lock avoidance operating systems' file system implementation and its interface.

**UNIT - I**

**Basic Structure of Computers:** Computer Types, Functional UNIT, Basic OPERATIONAL Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating – Point Representation.

**Register Transfer Language and Micro Operations:** Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions– Instruction Cycle.

Memory – Reference Instructions, Input – Output and Interrupt, STACK

Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

**UNIT - II**

**Micro Programmed Control:** Control Memory, Address Sequencing, Microprogram Examples, Design of Control Unit, Hard Wired Control, Microprogrammed Control.

**The Memory System:** Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual99 Memories Secondary Storage, Introduction to RAID.

**UNIT - III**

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input – Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

**UNIT - IV**

**Operating Systems Overview:** Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating Systems Generation.

**Memory Management:** Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows

**Principles of Deadlock:** System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

**UNIT - V**

**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, Allocation Methods, Free-Space Management.

**TEXT BOOKS:**

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Systems Architecture – M. Moris Mano, 3rd Edition, Pearson
3. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 8th Edition, John Wiley.

**REFERENCE BOOKS:**

1. Computer Organization and Architecture – William Stallings 6<sup>th</sup> Edition, Pearson
2. Structured Computer Organization – Andrew S. Tanenbaum, 4<sup>th</sup> Edition PHI
3. Fundamentals of Computer Organization and Design – Sivaraama Dandamudi Springer Int. Edition.

4. Operating Systems – Internals and Design Principles, Stallings, 6<sup>th</sup> Edition–2009, Pearson Education.
5. Modern Operating Systems, Andrew S Tanenbaum 2nd Edition, PHI.
6. Principles of Operating Systems, B. L. Stuart, Cengage Learning, India Edition.

**DIGITAL IMAGE PROCESSING**  
**(Professional Elective – I)**

**B.Tech. III Year II Sem.**  
**Course Code: EC612PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- To comprehend the relation between human visual system and machine perception and processing of digital images.
- To provide a detailed approach towards image processing applications like enhancement, segmentation, and compression.

**Course Outcomes:**

- Exploration of the limitations of the computational methods on digital images.
- Expected to implement the spatial and frequency domain image transforms on enhancement and restoration of images.
- Elaborate understanding on image enhancement techniques.
- Expected to define the need for compression and evaluate the basic compression algorithms.

**UNIT - I**

**Digital Image Fundamentals & Image Transforms:** Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.

**Image Transforms:** 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

**UNIT - II**

**Image Enhancement (Spatial Domain):** Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering.

**Image Enhancement (Frequency Domain):** Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

**UNIT - III**

**Image Restoration:** Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

**UNIT – IV**

**Image Segmentation:** Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation.

**Morphological Image Processing:** Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

**UNIT - V**

**Image Compression:** Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

**TEXT BOOKS:**

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3<sup>rd</sup> Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- MC GRAW HILL EDUCATION, 2010.

**REFERENCE BOOKS:**

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2<sup>nd</sup> Ed, CRC Press, 2011
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2<sup>nd</sup> Edition, MC GRAW HILL EDUCATION, 2010.
3. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
4. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2<sup>nd</sup> Edition

**SPREAD SPECTRUM COMMUNICATIONS**  
(Professional Elective – I)

**B.Tech. III Year II Sem.**  
**Course Code: EC613PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:** The objectives of this course are to make the student

- Understand the concept of Spread Spectrum and study various types of Spread spectrum sequences and their generation.
- Understand the principles of Code Division Multiple Access (CDMA) and use of Spread spectrum concept in CDMA
- Understand various Code tracking loops for optimum tracking of wideband signals viz spread spectrum signals
- Understand the procedure for synchronization of receiver for receiving the Spread spectrum signal.
- Study the performance of spread spectrum systems in Jamming environment, systems with Forward Error Correction and Multiuser detection in CDMA cellular radio.

**Course Outcomes:** On completion of this course student will be able to

- Generate various types of Spread spectrum sequences and can simulate CDMA system (Both Transmitter & Receiver).
- Analyze the performance of Spread spectrum systems in Jamming environment and systems with Forward Error Correction.
- Can provide detection and cancellation schemes for Multiusers in CDMA cellular radio.

**UNIT - I**

Introduction to Spread Spectrum Systems: Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access.

Binary Shift Register Sequences for Spread Spectrum Systems: Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

**UNIT - II**

Code Tracking Loops: Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non-Coherent Tracking Loop, Double Dither Non-Coherent Tracking Loop.

**UNIT - III**

Initial Synchronization of the Receiver Spreading Code: Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter, Synchronization by Estimated the Received Spreading Code.

**UNIT - IV**

Cellular Code Division Multiple Access (CDMA) Principles: Introduction, Wide Band Mobile Channel, The Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity.

Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.

**UNIT - V**

Performance of Spread Spectrum Systems in Jamming Environments: Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding.

Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.

**TEXT BOOKS:**

1. Rodger E Ziemer, Roger L. Peterson and David E Borth - "Introduction to Spread Spectrum Communication- Pearson, 1st Edition, 1995.
2. Mosa Ali Abu-Rgheff – "Introduction to CDMA Wireless Communications." Elsevier Publications, 2008.

**REFERENCE BOOKS:**

1. George R. Cooper, Clare D. Mc Gillem - "Modern Communication and Spread Spectrum," McGraw Hill, 1986.
2. Andrew j. Viterbi - "CDMA: Principles of spread spectrum communication," Pearson Education, 1st Edition, 1995.

**DIGITAL SYSTEM DESIGN**  
**(Professional Elective – I)**

**B.Tech. III Year II Sem.**  
**Course Code: EC614PE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- To provide extended knowledge of digital logic circuits in the form of state model approach.
- To provide an overview of system design approach using programmable logic devices.
- To provide and understand of fault models and test methods.

**Course Outcomes:**

- To understands the minimization of Finite state machine.
- To exposes the design approaches using ROM's, PAL's and PLA's.
- To provide in depth understanding of Fault models.
- To understands test pattern generation techniques for fault detection.
- To design fault diagnosis in sequential circuits.

**UNIT - I**

**Minimization and Transformation of Sequential Machines:** The Finite State Model – Capabilities and limitations of FSM – State equivalence and machine minimization – Simplification of incompletely specified machines.  
Fundamental mode model – Flow table – State reduction – Minimal closed covers – Races, Cycles and Hazards.

**UNIT - II**

**Digital Design:** Digital Design Using ROMs, PALs and PLAs , BCD Adder, 32 – bit adder, State graphs for control circuits, Scoreboard and Controller, A shift and add multiplier, Array multiplier, Keypad Scanner, Binary divider.

**UNIT - III**

**SM Charts:** State machine charts, Derivation of SM Charts, Realization of SM Chart, Implementation of Binary Multiplier, dice game controller.

**UNIT - IV:**

**Fault Modeling & Test Pattern Generation:** Logic Fault model – Fault detection & Redundancy- Fault equivalence and fault location –Fault dominance – Single stuck at fault model – Multiple stuck at fault models –Bridging fault model.  
Fault diagnosis of combinational circuits by conventional methods – Path sensitization techniques, Boolean Difference method – Kohavi algorithm – Test algorithms – D algorithm,



PODEM, Random testing, Transition count testing, Signature analysis and test bridging faults.

**UNIT - V**

**Fault Diagnosis in Sequential Circuits:** Circuit Test Approach, Transition Check Approach – State identification and fault detection experiment, Machine identification, Design of fault detection experiment

**TEXT BOOKS:**

1. Fundamentals of Logic Design – Charles H. Roth, 5<sup>th</sup> ed., Cengage Learning.
2. Digital Systems Testing and Testable Design – Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman- John Wiley & Sons Inc.

**REFERENCE BOOKS:**

1. Switching and Finite Automata Theory – Z. Kohavi , 2<sup>nd</sup> ed., 2001, McGraw Hill
2. Digital Design – Morris Mano, M.D.Ciletti, 4<sup>th</sup> Edition, Pearson

## ANTENNAS AND WAVE PROPAGATION

**B.Tech. III Year II Sem.**  
**Course Code: EC601PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
4	0	0	4

**Course Objectives:** This can be termed a middle level course in the electronic communication engineering domain. The course deals with antenna basics, different types of antennas, some design features, antenna measurements and wave propagation, and has the following main objectives:

- To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.
- To distinguish between UHF, VHF and Microwave Antennas, their requirements, specifications, characteristics and design relations.
- To analyze the characteristics of yagi-uda antennas, helical antennas, pyramidal horns, microstrip patch antennas and parabolic reflectors and identify the requirements to facilitate their design.
- To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.
- To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.
- To define and distinguish between different phenomenon of wave propagation (ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying their profiles and parameters involved.

**Course Outcomes:** Having gone through this course on Antenna Theory and Techniques, and Wave Propagation, the students would be able to:

- Explain the mechanism of radiation, distinguish between different antenna characteristic parameters, establish their mathematical relations, estimate them for different practical cases.
- Distinguish between short dipoles, half-wave dipoles, quarter-wave monopoles and small loops, configure their current distributions, derive their far fields and radiation characteristics and sketch their patterns.
- Characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of folded dipole, Yagi-Uda Antenna, Helical Antennas, Horn Antennas, and to acquire the knowledge of their analysis, design and development.
- Analyze a microstrip rectangular patch antenna and a parabolic reflector antenna, identify the requirements and relevant feed structure, carry out the design and establish their patterns.
- Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory.

- Carry out the Linear Array Analysis, estimate the array factor and characteristics and sketch the pattern for 2-element array, N-element BSA, EFA, modified EFA, Binomial Arrays.
- Classify the different wave propagation mechanisms, identify their frequency ranges, determine the characteristic features of ground wave, ionospheric wave, space wave, duct and tropospheric propagations, and estimate the parameters involved.

### UNIT - I

**Antenna Basics:** Introduction, Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height, Illustrative Problems.

Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

**Thin Linear Wire Antennas** – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

### UNIT - II

**VHF, UHF and Microwave Antennas - I** : Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Mono filar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat’s Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

### UNIT - III

**VHF, UHF and Microwave Antennas - II:** Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems.

### UNIT - IV

**Antenna Arrays:** Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Illustrative Problems.

**Antenna Measurements:** Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

#### **UNIT - V**

**Wave Propagation – I:** Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.

**Wave Propagation – II:** Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

#### **TEXT BOOKS:**

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, MC GRAW HILL EDUCATION, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

#### **REFERENCE BOOKS:**

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3<sup>rd</sup> Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

## MICROPROCESSORS AND MICROCONTROLLERS

**B.Tech. III Year II Sem.**  
**Course Code: EC602PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
4	0	0	4

### Course Objectives:

- To develop an understanding of the operations of microprocessors and micro controllers; machine language programming and interfacing techniques.

### Course Outcomes:

- Understands the internal architecture and organization of 8086, 8051 and ARM processors/controllers.
- Understands the interfacing techniques to 8086 and 8051 and can develop assembly language programming to design microprocessor/ micro controller based systems.

### UNIT - I

**8086 Architecture:** 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

**Instruction Set and Assembly Language Programming of 8086:** Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

### UNIT - II

**Introduction to Microcontrollers:** Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

**8051 Real Time Control:** Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

### UNIT – III

**I/O And Memory Interface:** LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

**Serial Communication and Bus Interface:** Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

### UNIT – IV

**ARM Architecture:** ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

**UNIT – V**

**Advanced ARM Processors:** Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

**TEXT BOOKS:**

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2<sup>nd</sup> Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3<sup>rd</sup> Ed.
3. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

**REFERENCE BOOKS:**

1. Microprocessors and Interfacing, D. V. Hall, MGH, 2<sup>nd</sup> Edition 2006.
2. Introduction to Embedded Systems, Shibu K.V, MHE, 2009
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.

## DIGITAL SIGNAL PROCESSING

**B.Tech. III Year II Sem.**  
**Course Code: EC603PC**

L	T	P	C
4	0	0	4

**Course Objectives:** This course is an essential course that provides design techniques for processing all type of signals in various fields. The main objectives are:

- To provide background and fundamental material for the analysis and processing of digital signals.
- To familiarize the relationships between continuous-time and discrete time signals and systems.
- To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
- The impetus is to introduce a few real-world signal processing applications.
- To acquaint in FFT algorithms, Multi-rate signal processing techniques and finite word length effects.

**Course Outcomes:** On completion of this subject, the student should be able to:

- Perform time, frequency, and Z -transform analysis on signals and systems.
- Understand the inter-relationship between DFT and various transforms.
- Understand the significance of various filter structures and effects of round off errors.
- Design a digital filter for a given specification.
- Understand the fast computation of DFT and appreciate the FFT processing.
- Understand the tradeoffs between normal and multi rate DSP techniques and finite length word effects.

### UNIT - I

**Introduction:** Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

**Realization of Digital Filters:** Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

### UNIT - II

**Discrete Fourier Transforms:** Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

**Fast Fourier Transforms:** Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT, and FFT with General Radix-N.

### UNIT - III

**IIR Digital Filters:** Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

### UNIT - IV

**FIR Digital Filters:** Characteristics of FIR Digital Filters, Frequency Response, Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

### UNIT - V

**Multirate Digital Signal Processing:** Introduction, Down Sampling, Decimation, Upsampling, Interpolation, Sampling Rate Conversion, Conversion of Band Pass Signals, Concept of Resampling, Applications of Multi Rate Signal Processing.

**Finite Word Length Effects:** Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round off Noise, Methods to Prevent Overflow, Trade off between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

### TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
3. Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009

### REFERENCES:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2<sup>nd</sup> Edition, Pearson Education, 2009



**DIGITAL SIGNAL PROCESSING LAB**

**B.Tech. III Year II Sem.**  
**Course Code: EC604PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**Note:**

1. The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).
2. Minimum of 12 experiments to be conducted.

**List of Experiments**

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

**MICROPROCESSORS AND MICROCONTROLLERS LAB**

**B.Tech. III Year II Sem.**  
**Course Code: EC605PC**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**Note:** - Minimum of 12 experiments to be conducted.

The following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

**List of Experiments:**

1. Programs for 16 bit arithmetic operations 8086(using various addressing modes)
2. Programs for sorting an array for 8086.
3. Programs for searching for a number of characters in a string for 8086.
4. Programs for string manipulation for 8086.
5. Programs for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor kits using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART operation in 8051.
14. Communication between 8051 kit and PC
15. Interfacing LCD to 8051
16. Interfacing Matrix/Keyboard to 8051
17. Data transfer from peripheral to memory through DMA controller 8237/8257

**ADVANCED ENGLISH COMMUNICATION SKILLS (AECS) LAB**

**B.Tech. III Year II Sem.**  
**Course Code: EN606HS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**Introduction**

A course on *Advanced English Communication Skills (AECS) Lab* is considered essential at the third year level of B.Tech and B.Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

**Course Objectives:** This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve students' fluency in spoken English
- To enable them to listen to English spoken at normal conversational speed
- To help students develop their vocabulary
- To read and comprehend texts in different contexts
- To communicate their ideas relevantly and coherently in writing
- To make students industry-ready
- To help students acquire behavioural skills for their personal and professional life
- To respond appropriately in different socio-cultural and professional contexts

**Course Outcomes:** Students will be able to:

- Acquire vocabulary and use it contextually
- Listen and speak effectively
- Develop proficiency in academic reading and writing
- Increase possibilities of job prospects
- Communicate confidently in formal and informal contexts

**Syllabus**

The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

1. **Inter-personal Communication and Building Vocabulary** - Starting a Conversation – Responding Appropriately and Relevantly – Using Appropriate Body Language – Role Play in Different Situations - Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.
2. **Reading Comprehension** –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, , Skimming, Scanning, Inferring Meaning.
3. **Writing Skills** – Structure and Presentation of Different Types of Writing – Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.
4. **Presentation Skills** – Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ e-mails/Assignments... etc.,
5. **Group Discussion and Interview Skills** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation- Concept and Process,

Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

**Minimum Hardware Requirement:**

Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics**
- **Eight round tables with five movable chairs for each table.**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **Computer with suitable configuration**

**Suggested Software:** The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass, 8<sup>th</sup> Edition**
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**

**REFERENCES:**

1. Kumar, Sanjay and Pushp Lata. *English for Effective Communication*, Oxford University Press, 2015.
2. Konar, Nira. *English Language Laboratories – A Comprehensive Manual*, PHI Learning Pvt. Ltd., 2011.