

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**B.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING**  
**COURSE STRUCTURE & SYLLABUS (R18)**

**Applicable From 2018-19 Admitted Batch**

**II YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC301PC	Electronic Devices and Circuits	3	1	0	4
2	EC302PC	Network Analysis and Transmission Lines	3	0	0	3
3	EC303PC	Digital System Design	3	1	0	4
4	EC304PC	Signals and Systems	3	1	0	4
5	EC305ES	Probability Theory and Stochastic Processes	3	0	0	3
6	EC306PC	Electronic Devices and Circuits Lab	0	0	2	1
7	EC307PC	Digital System Design Lab	0	0	2	1
8	EC308ES	Basic Simulation Lab	0	0	2	1
9	*MC309	Constitution of India	3	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>3</b>	<b>6</b>	<b>21</b>

**II YEAR II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA401BS	Laplace Transforms, Numerical Methods & Complex Variables	3	1	0	4
2	EC402PC	Electromagnetic Fields and Waves	3	0	0	3
3	EC403PC	Analog and Digital Communications	3	1	0	4
4	EC404PC	Linear IC Applications	3	0	0	3
5	EC405PC	Electronic Circuit Analysis	3	0	0	3
6	EC406PC	Analog and Digital Communications Lab	0	0	3	1.5
7	EC407PC	IC Applications Lab	0	0	3	1.5
8	EC408PC	Electronic Circuit Analysis Lab	0	0	2	1
9	*MC409	Gender Sensitization Lab	0	0	2	0
		<b>Total Credits</b>	<b>15</b>	<b>2</b>	<b>10</b>	<b>21</b>

**\*MC – Satisfactory/Unsatisfactory**

**EC301PC: ELECTRONIC DEVICES AND CIRCUITS****B.Tech. II Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Course Objectives:**

- To introduce components such as diodes, BJTs and FETs.
- To know the applications of components.
- To know the switching characteristics of components
- To give understanding of various types of amplifier circuits

**Course Outcomes:** Upon completion of the Course, the students will be able to:

- Know the characteristics of various components.
- Understand the utilization of components.
- Understand the biasing techniques
- Design and analyze small signal amplifier circuits.

**UNIT - I****Diode and Applications:** Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times.

Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

**UNIT - II****Bipolar Junction Transistor (BJT):** Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.**UNIT - III****Junction Field Effect Transistor (FET):** Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor.**Special Purpose Devices:** Zener Diode - Characteristics, Voltage Regulator. Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.**UNIT – IV****Analysis and Design of Small Signal Low Frequency BJT Amplifiers:** Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h- parameters in CE, CB and CC configurations, Transistor amplifying action, Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.**UNIT – V****FET Amplifiers:** Small Signal Model, Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers. MOSFET Characteristics in Enhancement and Depletion mode, Basic Concepts of MOS Amplifiers.**TEXT BOOKS:**

1. Electronic Devices and Circuits- Jacob Millman, McGraw Hill Education
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11<sup>th</sup> Edition, 2009, Pearson.

**REFERENCE BOOKS:**

1. The Art of Electronics, Horowitz, 3<sup>rd</sup> Edition Cambridge University Press
2. Electronic Devices and Circuits, David A. Bell – 5<sup>th</sup> Edition, Oxford.
3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2Ed., 2008, Mc Graw Hill.

**EC302PC: NETWORK ANALYSIS AND TRANSMISSION LINES****B.Tech. II Year I Sem.**

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

**Pre-Requisites:** Nil**Course Objectives:**

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states in RLC circuits.
- To understand the two port network parameters.
- To study the propagation, reflection and transmission of plane waves in bounded and unbounded media.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

- Gain the knowledge on basic RLC circuits behavior.
- Analyze the Steady state and transient analysis of RLC Circuits.
- Know the characteristics of two port network parameters.
- Analyze the transmission line parameters and configurations.

**UNIT - I**

Network Topology, Basic cutset and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

**UNIT - II**

Transient and Steady state analysis of RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. RC Circuits as integrator and differentiators. 2<sup>nd</sup> order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves.

**UNIT - III**

Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T,  $\pi$ , L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

**UNIT – IV**

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Types of Distortion, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.

**UNIT – V**

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR.  $\lambda/4$ ,  $\lambda/2$ ,  $\lambda/8$  Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single Stub Matching.

**TEXT BOOKS:**

1. Network Analysis – Van Valkenburg, 3<sup>rd</sup> Ed., Pearson, 2016.
2. Networks, Lines and Fields - JD Ryder, PHI, 2<sup>nd</sup> Edition, 1999.

**REFERENCE BOOKS:**

1. Electric Circuits – J. Edminister and M. Nahvi – Schaum's Outlines, Mc Graw Hills Education, 1999.
2. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 8<sup>th</sup> Edition, 1993.
3. Electromagnetics with Applications – JD. Kraus, 5<sup>th</sup> Ed., TMH
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

**EC303PC: DIGITAL SYSTEM DESIGN****B.Tech. II Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Pre-Requisites:** Nil**Course Objectives:**

- To understand common forms of number representation in logic circuits
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand the concepts of combinational logic circuits and sequential circuits.
- To understand the Realization of Logic Gates Using Diodes & Transistors.

**Course Outcomes:** Upon completing this course, the student will be able to

- Understand the numerical information in different forms and Boolean Algebra theorems
- Postulates of Boolean algebra and to minimize combinational functions
- Design and analyze combinational and sequential circuits
- Known about the logic families and realization of logic gates.

**UNIT - I:****Number Systems:** Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.**Boolean Algebra:** Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.**UNIT - II:****Minimization of Boolean functions:** Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method,**Combinational Logic Circuits:** Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.**UNIT - III****Sequential Circuits Fundamentals:** Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.**Registers and Counters:** Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.**UNIT - IV****Sequential Machines:** Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters. Finite state machine-capabilities and limitations, Mealy and Moore models.**UNIT - V****Realization of Logic Gates Using Diodes & Transistors:** AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate- Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri-state outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.

**TEXT BOOKS:**

1. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3<sup>rd</sup> Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3<sup>rd</sup> Edition, 2007- Tata McGraw-Hill

**REFERENCE BOOKS:**

1. Digital Design- Morris Mano, PHI, 4th Edition, 2006
2. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.
4. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013

**EC304PC: SIGNALS AND SYSTEMS****B.Tech. II Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Pre-requisite:** Nil**Course Objectives:**

- This gives the basics of Signals and Systems required for all Electrical Engineering related courses.
- To understand the behavior of signal in time and frequency domain
- To understand the characteristics of LTI systems
- This gives concepts of Signals and Systems and its analysis using different transform techniques.

**Course Outcomes:** Upon completing this course, the student will be able to

- Differentiate various signal functions.
- Represent any arbitrary signal in time and frequency domain.
- Understand the characteristics of linear time invariant systems.
- Analyze the signals with different transform technique

**UNIT - I**

**Signal Analysis:** Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

**UNIT – II**

**Fourier series:** Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

**Fourier Transforms:** Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

**UNIT - III**

**Signal Transmission through Linear Systems:** Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

**UNIT – IV**

**Laplace Transforms:** Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

**Z-Transforms:** Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.



**UNIT - V**

**Sampling theorem:** Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

**Correlation:** Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

**TEXT BOOKS:**

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.

**REFERENCE BOOKS:**

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE.
5. Signals and Systems – K. Deergha Rao, Birkhauser, 2018.

**EC305ES: PROBABILITY THEORY AND STOCHASTIC PROCESSES****B.Tech. II Year I Sem.**

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

**Pre-requisite:** Nil**Course Objectives:**

- This gives basic understanding of random signals and processes
- Utilization of Random signals and systems in Communications and Signal Processing areas.
- To know the Spectral and temporal characteristics of Random Process.
- To Learn the Basic concepts of Noise sources

**Course Outcomes:** Upon completing this course, the student will be able to

- Understand the concepts of Random Process and its Characteristics.
- Understand the response of linear time Invariant system for a Random Processes.
- Determine the Spectral and temporal characteristics of Random Signals.
- Understand the concepts of Noise in Communication systems.

**UNIT - I**

**Probability & Random Variable:** Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, *Random Variable*- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

**UNIT - II**

**Operations On Single & Multiple Random Variables – Expectations:** Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence.

Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

**UNIT - III**

**Random Processes – Temporal Characteristics:** The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System

Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

#### UNIT - IV

**Random Processes – Spectral Characteristics:** The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

#### UNIT - V

**Noise Sources & Information Theory:** Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

#### TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4<sup>th</sup> Edition, 2001.
2. Principles of Communication systems by Taub and Schilling (TMH), 2008

#### REFERENCE BOOKS:

1. Random Processes for Engineers-Bruce Hajck, Cambridge unipress, 2015
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
3. Probability, Statistics & Random Processes-K. Murugesan, P. Guruswamy, Anuradha Agencies, 3<sup>rd</sup> Edition, 2003.
4. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2003.
5. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

**EC306PC: ELECTRONIC DEVICES AND CIRCUITS LAB****B.Tech. II Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**List of Experiments (Twelve experiments to be done):**

Verify any twelve experiments in H/W Laboratory

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Zener diode characteristics and Zener as voltage Regulator
3. Full Wave Rectifier with & without filters
4. Input and output characteristics of BJT in CE Configuration
5. Input and output characteristics of FE in CS Configuration
6. Common Emitter Amplifier Characteristics
7. Common Base Amplifier Characteristics
8. Common Source amplifier Characteristics
9. Measurement of h-parameters of transistor in CB, CE, CC configurations
10. Switching characteristics of a transistor
11. SCR Characteristics.
12. Types of Clippers at different reference voltages
13. Types of Clampers at different reference voltages
14. The steady state output waveform of clampers for a square wave input

**Major Equipment required for Laboratories:**

1. Regulated Power Suppliers, 0-30V
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multimeters
5. Electronic Components

**EC307PC: DIGITAL SYSTEM DESIGN LAB****B.Tech. II Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Note: Implement using digital ICs, all experiments to be carried out.****List of Experiments -**

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of an 8 bit parallel load and serial out shift register using flip-flops.
7. Design and realization of a Synchronous and Asynchronous counter using flip-flops
8. Design and realization of Asynchronous counters using flip-flops
9. Design and realization of 8x1 MUX using 2x1 MUX
10. Design and realization of 4 bit comparator
11. Design and Realization of a sequence detector-a finite state machine

**Major Equipments required for Laboratories:**

1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multimeter.

**EC308ES: BASIC SIMULATION LAB****B.Tech. II Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Note:**

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 15 experiment are to be completed

**List of Experiments:**

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution for Signals and sequences.
6. Auto Correlation and Cross Correlation for Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
9. Gibbs Phenomenon Simulation.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
13. Generation of Gaussian noise ( Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Verification of Sampling Theorem.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process for Stationarity in Wide sense.

**Major Equipments required for Laboratories:**

1. Computer System with latest specifications connected
2. Window Xp or equivalent
3. Simulation software-MAT Lab or any equivalent simulation software

**\*MC309/\*MC409: CONSTITUTION OF INDIA****B.Tech. II Year I Sem.**

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

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

**Course content**

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

**MA401BS: LAPLACE TRANSFORMS, NUMERICAL METHODS AND COMPLEX VARIABLES****B.Tech. II Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Pre-requisites:** Mathematical Knowledge at pre-university level**Course Objectives:** To learn

- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- Various methods to find roots of an equation.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

**Course outcomes:** After learning the contents of this paper the student must be able to

- Use the Laplace transforms techniques for solving ODE's
- Find the root of a given equation.
- Estimate the value for the given data using interpolation
- Find the numerical solutions for a given ODE's
- Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
- Taylor's and Laurent's series expansions of complex Function

**UNIT - I****Laplace Transforms****10 L**

Laplace Transforms; Laplace Transform of standard functions; first shifting theorem; Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Special functions; Laplace transform of periodic functions.

Inverse Laplace transform by different methods, convolution theorem (without Proof), solving ODEs by Laplace Transform method.

**UNIT - II****Numerical Methods – I****10 L**

Solution of polynomial and transcendental equations – Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method.

Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation

**UNIT - III****Numerical Methods – II****08 L**

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods; Runge-Kutta method of fourth order.



**UNIT - IV****Complex Variables (Differentiation)****10 L**

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne-Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

**UNIT - V****Complex Variables (Integration)****10 L**

Line integrals, Cauchy's theorem, Cauchy's Integral formula, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof); zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof)

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

**REFERENCE BOOKS:**

1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

**EC402PC: ELECTROMAGNETIC FIELDS AND WAVES****B.Tech. II Year II Sem.**

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

**Pre-requisite:** Applied Physics**Course Objectives:**

- 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 waveguides and to determine the characteristics of rectangular waveguides, microstrip lines .

**Course Outcomes:** Upon completing this course, the student will be able to

- Get the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields.
- Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions.
- Analyze the Wave Equations for good conductors, good dielectrics and evaluate the UPW Characteristics for several practical media of interest.
- To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides 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. 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.

**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.

**UNIT – III**

**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 Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

**UNIT – IV**

**EM Wave Characteristics:** Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization.

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.

#### **UNIT – V**

**Waveguides:** Electromagnetic Spectrum and Bands. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Phase and Group Velocities, Wavelengths and Impedance Relations, Equation of Power Transmission, Impossibility of TEM Mode. Microstrip Lines –  $Z_0$  Relations, Effective Dielectric Constant.

#### **TEXT BOOKS:**

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 8<sup>th</sup> Ed., McGrawHill, 2014
2. Principles of Electromagnetics – Matthew N.O. Sadiku and S.V. Kulkarni, 6<sup>th</sup> Ed., Oxford University Press, Aisan Edition, 2015.

#### **REFERENCE BOOKS:**

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2<sup>nd</sup> Ed., 2000, PHI.
2. Engineering Electromagnetics – Nathan Ida, 2<sup>nd</sup> Ed., 2005, Springer (India) Pvt. Ltd., New Delhi.

**EC403PC: ANALOG AND DIGITAL COMMUNICATIONS****B.Tech. II Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Prerequisite:** Probability theory and Stochastic Processes**Course Objectives:**

- To develop ability to analyze system requirements of analog and digital communication systems.
- To understand the generation, detection of various analog and digital modulation techniques.
- To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
- To understand the concepts of baseband transmissions.

**Course Outcomes:** Upon completing this course, the student will be able to

- Analyze and design of various continuous wave and angle modulation and demodulation techniques
- Understand the effect of noise present in continuous wave and angle modulation techniques.
- Attain the knowledge about AM, FM Transmitters and Receivers
- Analyze and design the various Pulse Modulation Techniques.
- Understand the concepts of Digital Modulation Techniques and Baseband transmission.

**UNIT - I**

**Amplitude Modulation:** Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

**UNIT - II**

**Angle Modulation:** Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

**UNIT - III**

**Transmitters:** Classification of Transmitters, AM Transmitters, FM Transmitters

**Receivers:** Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

**UNIT - IV**

**Pulse Modulation:** Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM.

**Pulse Code Modulation:** PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

## **UNIT - V**

**Digital Modulation Techniques:** ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non-Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.

**Baseband Transmission and Optimal Reception of Digital Signal:** A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

### **TEXTBOOKS:**

1. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5<sup>th</sup> Edition, 2009, PHI.

### **REFERENCE BOOKS:**

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3<sup>rd</sup> Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4<sup>th</sup> Edition , PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004
4. Analog and Digital Communication – K. Sam Shanmugam, Willey ,2005

**EC405PC: ELECTRONIC CIRCUIT ANALYSIS****B.Tech. II Year II Sem.**

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

**Pre-requisite:** Electronic Devices and Circuits**Course Objectives:**

- Learn the concepts of high frequency analysis of transistors.
- To give understanding of various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
- To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback
- To construct various multivibrators using transistors and sweep circuits.

**Course Outcomes:** Upon completing this course, the student will be able to

- Design the multistage amplifiers and understand the concepts of High Frequency Analysis of Transistors.
- Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations
- Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.
- Design Multivibrators and sweep circuits for various applications.

**UNIT – I**

**Multistage Amplifiers:** Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Casca RC Coupled amplifiers, Cascode amplifier, Darlington pair.

**Transistor at High Frequency:** Hybrid  $\pi$  model of Common Emitter transistor model,  $f_\alpha$ ,  $f_\beta$  and unity gain bandwidth, Gain-bandwidth product.

**UNIT II**

**Feedback Amplifiers:** Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

**UNIT -III**

**Oscillators:** Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator.

**UNIT -IV**

**Large Signal Amplifiers:** Class A Power Amplifier- Series fed and Transformer coupled , Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class –C Amplifiers.

**Tuned Amplifiers:** Introduction, single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

**UNIT –V**

**Multivibrators:** Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

**Time Base Generators:** General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Methods of Linearity improvement.

**TEXT BOOKS:**

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education.
2. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, Pearson.

**REFERENCE BOOKS:**

1. Electronic Devices and Circuits, David A. Bell – 5<sup>th</sup> Edition, Oxford.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11<sup>th</sup> Edition, 2009, Pearson

**EC404PC: LINEAR IC APPLICATIONS****B.Tech. II Year II Sem.**

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

**Pre-requisite:** Electronic Devices & Circuits**Course Objectives:** The main objectives of the course are:

- To introduce the basic building blocks of linear integrated circuits.
- To introduce the theory and applications of analog multipliers and PLL.
- To introduce the concepts of waveform generation and introduce some special function ICs.

**Course Outcomes:** Upon completing this course, the student will be able to

- A thorough understanding of operational amplifiers with linear integrated circuits.
- Attain the knowledge of functional diagrams and applications of IC 555 and IC 565
- Acquire the knowledge about the Data converters.

**UNIT - I**

**Integrated Circuits:** Classification, chip size and circuit complexity, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

**UNIT - II**

**Op-amp and Applications:** Basic information of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, multipliers and dividers, differentiators and integrators, comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723

**UNIT - III**

**Active Filters & Oscillators:** Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation - RC, Wien and quadrature type, waveform generators - triangular, sawtooth, square wave and VCO.

**UNIT - IV**

**Timers & Phase Locked Loops:** Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

**UNIT - V**

**D-A and A-D Converters:** Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC dual slope integration type ADC, DAC and ADC specifications.

**TEXT BOOKS:**

1. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p) Ltd.
2. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

**REFERENCES BOOKS:**

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, McGraw Hill.
4. Digital Fundamentals - Floyd and Jain, Pearson Education.



**EC406PC: ANALOG AND DIGITAL COMMUNICATIONS LAB****B.Tech. II Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Note:**

- Minimum 12 experiments should be conducted:
- All these experiments are to be simulated first either using MATLAB, COMSIM or any other simulation package and then to be realized in hardware

**List of Experiments:**

1. (i) Amplitude modulation and demodulation (ii) Spectrum analysis of AM
2. (i) Frequency modulation and demodulation (ii) Spectrum analysis of FM
3. DSB-SC Modulator & Detector
4. SSB-SC Modulator & Detector (Phase Shift Method)
5. Frequency Division Multiplexing & De multiplexing
6. Pulse Amplitude Modulation & Demodulation
7. Pulse Width Modulation & Demodulation
8. Pulse Position Modulation & Demodulation
9. PCM Generation and Detection
10. Delta Modulation
11. Frequency Shift Keying: Generation and Detection
12. Binary Phase Shift Keying: Generation and Detection
13. Generation and Detection (i) DPSK (ii) QPSK

**Major Equipments required for Laboratories:**

1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
4. Regulated Power Supplies: 0-30V
5. MAT Lab/Equivalent Simulation Package with Communication tool box
6. Analog and Digital Modulation and Demodulation Trainer Kits.

**EC407PC: IC APPLICATIONS LAB****B.Tech. II Year II Semester**

L	T	P	C
0	0	3	1.5

**Note:** 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

**Major Equipments required for Laboratories:**

1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multimeter.

**EC408PC: ELECTRONIC CIRCUIT ANALYSIS LAB****B.Tech. II Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Note:**

- Experiments marked with \* has to be designed, simulated and verified in hardware.
- Minimum of 9 experiments to be done in hardware.

**Hardware Testing in Laboratory:**

1. Common Emitter Amplifier (\*)
2. Two Stage RC Coupled Amplifier
3. Cascode amplifier Circuit (\*)
4. Darlington Pair Circuit
5. Current Shunt Feedback amplifier Circuit
6. Voltage Series Feedback amplifier Circuit (\*)
7. RC Phase shift Oscillator Circuit (\*)
8. Hartley and Colpitt's Oscillators Circuit
9. Class A power amplifier
10. Class B Complementary symmetry amplifier (\*)
11. Design a Monostable Multivibrator
12. The output voltage waveform of Miller Sweep Circuit

**Major Equipments required for Laboratories:**

1. Computer System with latest specifications connected
2. Window XP or equivalent
3. Simulation software-Multisim or any equivalent simulation software
4. Regulated Power Suppliers, 0-30V
5. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
6. Functions Generators-Sine and Square wave signals
7. Multimeters
8. Electronic Components

**\*MC409/\*MC309: GENDER SENSITIZATION LAB**  
(An Activity-based Course)

**B.Tech. II Year II Sem.**

**L    T/P/D    C**  
**0    0/2/0    0**

**COURSE DESCRIPTION**

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

**Objectives of the Course:**

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

**Learning Outcomes:**

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

**UNIT - I: UNDERSTANDING GENDER**

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men  
- Preparing for Womanhood. Growing up Male. First lessons in Caste.

**UNIT – II: GENDER ROLES AND RELATIONS**

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

**UNIT – III: GENDER AND LABOUR**

Division and Valuation of Labour-Housework: The Invisible Labor- “My Mother doesn’t Work.” “Share the Load.”-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

**UNIT – IV: GENDER - BASED VIOLENCE**

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “*Chupulu*”.

Domestic Violence: Speaking Out to Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-“I Fought for my Life....”

**UNIT – V: GENDER AND CULTURE**

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

**Note:** Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

- ***Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on “Gender”.***

🔑 **ESSENTIAL READING:** The Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A.Suneetha, Uma Bhugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

**ASSESSMENT AND GRADING:**

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**B.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING**

**III YEAR COURSE STRUCTURE AND SYLLABUS (R18)**  
**Applicable From 2018-19 Admitted Batch**

**III YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC501PC	Microprocessors & Microcontrollers	3	1	0	4
2	EC502PC	Data Communications and Networks	3	1	0	4
3	EC503PC	Control Systems	3	1	0	4
4	SM504MS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective - I	3	0	0	3
6	EC505PC	Microprocessors & Microcontrollers Lab	0	0	3	1.5
7	EC506PC	Data Communications and Networks Lab	0	0	3	1.5
8	EN508HS	Advanced Communication Skills Lab	0	0	2	1
9	*MC510	Intellectual Property Rights	3	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>3</b>	<b>8</b>	<b>22</b>

**III YEAR II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC601PC	Antennas and Propagation	3	1	0	4
2	EC602PC	Digital Signal Processing	3	1	0	4
3	EC603PC	VLSI Design	3	1	0	4
4		Professional Elective - II	3	0	0	3
5		Open Elective - I	3	0	0	3
6	EC604PC	Digital Signal Processing Lab	0	0	3	1.5
7	EC605PC	e – CAD Lab	0	0	3	1.5
8	EC606PC	Scripting Languages Lab	0	0	2	1
9	*MC609	Environmental Science	3	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>3</b>	<b>8</b>	<b>22</b>

**\*MC - Environmental Science – Should be Registered by Lateral Entry Students Only.**

**Note:** Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

**Professional Elective – I**

EC511PE	Computer Organization & Operating Systems
EC512PE	Error Correcting Codes
EC513PE	Electronic Measurements and Instrumentation

**Professional Elective – II**

EC611PE	Object Oriented Programming through Java
EC612PE	Mobile Communications and Networks
EC613PE	Embedded System Design

**EC501PC: MICROPROCESSORS AND MICROCONTROLLERS****B.Tech. III Year I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Prerequisite:** Nil**Course Objectives:**

1. To familiarize the architecture of microprocessors and micro controllers
2. To provide the knowledge about interfacing techniques of bus & memory.
3. To understand the concepts of ARM architecture
4. To study the basic concepts of Advanced ARM processors

**Course Outcomes:** Upon completing this course, the student will be able to

1. Understands the internal architecture, organization and assembly language programming of 8086 processors.
2. Understands the internal architecture, organization and assembly language programming of 8051/controllers
3. Understands the interfacing techniques to 8086 and 8051 based systems.
4. Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors.

**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, TMH, 2<sup>nd</sup> Edition 2006.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

**REFERENCE BOOKS:**

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3<sup>rd</sup> Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2<sup>nd</sup> Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP- L138 Experimenter, Donald Reay, WILEY 2012.



**EC502PC: DATA COMMUNICATIONS AND NETWORKS****B.Tech. III Year I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Pre-requisite:** Digital Communications**Course Objectives:**

1. To introduce the Fundamentals of data communication networks
2. To demonstrate the Functions of various protocols of Data link layer.
3. To demonstrate Functioning of various Routing protocols.
4. To introduce the Functions of various Transport layer protocols.
5. To understand the significance of application layer protocols

**Course Outcomes:** Upon completing this course, the student will be able to

1. Know the Categories and functions of various Data communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms
5. Know the Functioning of various Application layer Protocols.

**UNIT - I:**

**Introduction to Data Communications:** Components, Data Representation, Data Flow, Networks-Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture,

**UNIT - II:**

**Data Link Layer:** Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame

**UNIT - III:**

**The Network Layer:** Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet- Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

**UNIT - IV:**

**Transport Layer:** Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow

Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control

**UNIT - V:**

**Application Layer:**

Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

**TEXTBOOKS:**

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6<sup>th</sup> Edition, Pearson.
2. Data Communications and Networking Behrouz A. Forouzan 4<sup>th</sup> Edition McGraw-Hill Education

**REFERENCES:**

1. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education
3. Understanding Communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.

**EC503PC: CONTROL SYSTEMS****B.Tech. III Year I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Prerequisite:** Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus  
Laplace Transforms, Numerical Methods and Complex variables

**Course objectives:**

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

**Course Outcomes:** At the end of this course, students will demonstrate the ability to

- Understand the modeling of linear-time-invariant systems using transfer function and state-space representations.
- Understand the concept of stability and its assessment for linear-time invariant systems.
- Design simple feedback controllers.

**UNT - I**

**Introduction to Control Problem:** Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

**UNT - II**

**Time Response Analysis of Standard Test Signals:** Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

**UNT - III**

**Frequency-Response Analysis:** Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

**UNT - IV**

**Introduction to Controller Design:** Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

**UNT - V**

**State Variable Analysis and Concepts of State Variables:** State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

**TEXT BOOKS:**

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.

**REFERENCE BOOKS:**

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.

**SM504MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS****B.Tech. III Year I Semester**

<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 learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

**Course Outcome:** The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

**UNIT – I: Introduction to Business and Economics**

**Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

**UNIT - II: Demand and Supply Analysis**

**Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

**Supply Analysis:** Determinants of Supply, Supply Function and Law of Supply.

**UNIT- III: Production, Cost, Market Structures & Pricing**

**Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

**Cost analysis:** Types of Costs, Short run and Long run Cost Functions.

**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

**UNIT - IV: Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

**UNIT - V: Financial Analysis through Ratios:** Concept of Ratio Analysis, Importance, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

**TEXT BOOKS:**

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

**REFERENCES:**

1. Paresb Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

**EC511PE: COMPUTER ORGANIZATION & OPERATING SYSTEMS****B.Tech. III Year I Semester**

<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:**

1. To understand the structure of a computer and its operations.
2. To understand the RTL and Micro-level operations and control in a computer.
3. Understanding the concepts of I/O and memory organization and operating systems.

**Course Outcomes:**

1. Able to visualize the organization of different blocks in a computer.
2. Able to use micro-level operations to control different units in a computer.
3. Able to use Operating systems in a computer.

**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, Virtual 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, IEEE 1394.

**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, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M. Moris Mano, IIIrd Edition, Pearson
3. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 8th Edition, John Wiley.

**REFERENCES:**

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI
3. Fundamentals of Computer Organization and Design - Sivaraama Dandamudi Springer Int. Edition.
4. Operating Systems – Internals and Design Principles, Stallings, sixth Edition–2009, Pearson Education.
5. Modern Operating Systems, Andrew S Tanenbaum 2<sup>nd</sup> Edition, PHI.
6. Principles of Operating Systems, B.L. Stuart, Cengage Learning, India Edition.



**EC512PE: ERROR CORRECTING CODES****B.Tech. III Year I Semester**

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

**Prerequisite:** Digital Communications**Course Objectives:**

1. To acquire the knowledge in measurement of information and errors.
2. To study the generation of various code methods used in communications.
3. To study the various application of codes.

**Course Outcomes:**

1. Able to transmit and store reliable data and detect errors in data through coding.
2. Able to understand the designing of various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes.

**UNIT – I:**

**Coding for Reliable Digital Transmission and storage:** Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

**Linear Block Codes:** Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

**UNIT - II:**

**Cyclic Codes:** Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

**UNIT – III:**

**Convolutional Codes:** Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

**UNIT – IV:**

**Turbo Codes:** LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

**UNIT - V:**

**Space-Time Codes:** Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing: General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

**TEXT BOOKS:**

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J. Costello, Jr, Prentice Hall, Inc.

2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill

**REFERENCE BOOKS:**

1. Error Correcting Coding Theory-Man Young Rhee-1989, McGraw – Hill Publishing, 19
2. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Digital Communications- John G. Proakis, 5<sup>th</sup> ed., 2008, TMH.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Error Correction Coding – Mathematical Methods and Algorithms – Todd K. Moon, 2006, Wiley India.
6. Information Theory, Coding and Cryptography – Ranjan Bose, 2<sup>nd</sup> Edition, 2009, TMH.

**EC513PE: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION****B.Tech. III Year I Semester**

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

**Prerequisite:** Basic Electrical and Electronics Engineering**Course Objectives:**

1. It provides an understanding of various measuring system functioning and metrics for performance analysis.
2. Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3. Understanding the concepts of various measuring bridges and their balancing conditions.
4. Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

**Course Outcomes:** Upon completing this course, the student will be able to

1. Measure electrical parameters with different meters and understand the basic definition of measuring parameters.
2. Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
3. Operate an Oscilloscope to measure various signals.
4. Measure various physical parameters by appropriately selecting the transducers.

**UNIT - I:**

**Block Schematics of Measuring Systems:** Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D'Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

**UNIT - II:**

**Signal Analyzers:** AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

**UNIT III:**

**Oscilloscopes:** CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

**Special Purpose Oscilloscopes:** Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

**UNIT IV:**

**Transducers:** Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

**UNIT V:**

**Bridges:** Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

**Measurement of Physical Parameters:** Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

**TEXT BOOKS:**

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbins, W. D. Cooper: PHI 5<sup>th</sup> Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2<sup>nd</sup> Edition 2004.

**REFERENCES:**

1. Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, Dhanpat Rai & Sons, 2013.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
3. Industrial Instrumentation: T.R. Padmanabham Springer 2009.
4. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.

**EC505PC: MICROPROCESSORS AND MICROCONTROLLERS LAB****B.Tech. III Year I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)**

- Assembly Language Programs to 8086 to Perform
  1. Arithmetic, Logical, String Operations on 16 Bit and 32-Bit Data.
  2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

**Cycle 2: Using 8051 Microcontroller Kit (6 weeks)**

- Introduction to IDE
  1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
  2. Time delay Generation Using Timers of 8051.
  3. Serial Communication from / to 8051 to / from I/O devices.
  4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer 0 8051 in 8 bit Auto reload Mode and Connect a 1 HZ Pulse to INT1 pin and Display on Port 0. Assume Crystal Frequency as 11.0592 MHZ

**Cycle 3: Interfacing I/O Devices to 8051(5 Weeks)**

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8 bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces to 8051.

**TEXT BOOKS:**

1. Advanced Microprocessors and Peripherals by A K Ray, Tata McGraw-Hill Education, 2006
2. The 8051 *Microcontrollers*: Architecture, Programming & Applications by Dr. K. Uma Rao, Andhe Pallavi, Pearson, 2009.

**EC506PC: DATA COMMUNICATIONS AND NETWORKS LAB****B.Tech. III Year I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Note:**

- A. Minimum of 12 Experiments have to be conducted
- B. All the Experiments may be Conducted using Network Simulation software like NS-2, NSG-2.1 and Wire SHARK/equivalent software.

Note: For Experiments 2 to 10 Performance may be evaluated through simulation by using the parameters Throughput, Packet Delivery Ratio, Delay etc.

1. Writing a TCL Script to create two nodes and links between nodes
2. Writing a TCL Script to transmit data between nodes
3. Evaluate the performance of various LAN Topologies
4. Evaluate the performance of Drop Tail and RED queue management schemes
5. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
6. Evaluate the performance of TCP and UDP Protocols
7. Evaluate the performance of TCP, New Reno and Vegas
8. Evaluate the performance of AODV and DSR routing protocols
9. Evaluate the performance of AODV and DSDV routing protocols
10. Evaluate the performance of IEEE 802.11 and IEEE 802.15.4
11. Evaluate the performance of IEEE 802.11 and SMAC
12. Capturing and Analysis of TCP and IP Packets
13. Simulation and Analysis of ICMP and IGMP Packets
14. Analyze the Protocols SCTP, ARP, NetBIOS, IPX VINES
15. Analysis of HTTP, DNS and DHCP Protocols

Major Equipment Required:

Required software (Open Source) like NS-2, NSG-2.1 and Wire SHARK

**EN508HS: ADVANCED COMMUNICATION SKILLS LAB****B.Tech. III Year I Semester**

L	T	P	C
0	0	2	1

**1. INTRODUCTION:**

The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

**2. OBJECTIVES:**

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

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**3. SYLLABUS:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

**4. MINIMUM REQUIREMENT:**

The 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.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

**5. SUGGESTED SOFTWARE:**

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7<sup>th</sup> Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

**TEXT BOOKS:**

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2<sup>nd</sup> Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5<sup>th</sup> Edition.

**REFERENCES:**

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.



**\*MC510: INTELLECTUAL PROPERTY RIGHTS****B.Tech. III Year I Semester**

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

**UNIT – I**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

**UNIT – III**

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT – V**

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

**EC601PC: ANTENNAS AND PROPAGATION****B.Tech. III Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Pre-requisite:** Electromagnetic Theory and Transmission Lines**Course Objectives:** The course objectives are:

1. 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.
2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.
3. To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.
4. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.
5. 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:** Upon completing this course, the student will be able to explain the mechanism of radiation, definitions of different antenna characteristic parameters and establish their mathematical relations.

1. Characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of VHF, UHF and Microwave antennas and also antenna arrays.
2. Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory.
3. Classify the different wave propagation mechanisms, determine the characteristic features of different wave propagations, and estimate the parameters involved.

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

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. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).**UNIT - II****Antenna Arrays:** Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.**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 - III:**

**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 Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

**UNIT - IV**

**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.

**UNIT - V:**

**Wave Propagation -** Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts,

**Ground Wave Propagation** –Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

**Space Wave Propagation** –Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

**Sky Wave Propagation** –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, TMH, 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.
3. Radio Engineering Handbook- Keith henney, 3<sup>rd</sup> edition TMH.
4. Antenna Engineering Handbook –John Leonidas Volakis, 3<sup>rd</sup> edition, 2007

**EC602PC: DIGITAL SIGNAL PROCESSING****B.Tech. III Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Prerequisite:** Signals and Systems**Course Objectives:**

1. To provide background and fundamental material for the analysis and processing of digital signals.
2. To understand the fast computation of DFT and appreciate the FFT processing.
3. To study the designs and structures of digital (IIR and FIR) filters and analyze and synthesize for a given specifications.
4. To acquaint in Multi-rate signal processing techniques and finite word length effects.

**Course Outcomes:** Upon completing this course, the student will be able to

1. Understand the LTI system characteristics and Multirate signal processing.
2. Understand the inter-relationship between DFT and various transforms.
3. Design a digital filter for a given specification.
4. Understand the significance of various filter structures and effects of round off errors.

**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

**Multirate Digital Signal Processing:** Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

**UNIT - II:**

**Discrete Fourier series:** Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, 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.

**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**

**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.

**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. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

**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 – S. Salivahanan, A. Vallavaraj and C. Gnanapriya, TMH, 2009
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2<sup>nd</sup> Edition, Pearson Education, 2009

**EC603PC: VLSI DESIGN****B.Tech. III Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Prerequisite:** Electronic Circuit Analysis; Switching Theory and Logic Design**Course Objectives:** The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of any system using gates.
5. Understand basic programmable logic devices and testing of CMOS circuits.

**Course Outcomes:** Upon completing this course, the student will be able to

1. Acquire qualitative knowledge about the fabrication process of integrated circuits using MOS transistors.
2. Draw the layout of any logic circuit which helps to understand and estimate parasitic effect of any logic circuit
3. Design building blocks of data path systems, memories and simple logic circuits using PLA, PAL, FPGA and CPLD.
4. Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.

**UNIT – I****Introduction:** Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS**Basic Electrical Properties:** Basic Electrical Properties of MOS and BiCMOS Circuits:  $I_{ds}$ - $V_{ds}$  relationships, MOS transistor threshold Voltage,  $g_m$ ,  $g_{ds}$ , Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.**UNIT - II****VLSI Circuit Design Processes:** VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.**UNIT – III****Gate Level Design:** Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out.**UNIT - IV****Data Path Subsystems:** Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.**Array Subsystems:** SRAM, DRAM, ROM, Serial Access Memories.**UNIT - V****Programmable Logic Devices:** Design Approach – PLA, PAL, Standard Cells FPGAs, CPLDs.**CMOS Testing:** CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques.**TEXT BOOKS:**

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition

2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3<sup>rd</sup> Ed, Pearson, 2009.

**REFERENCE BOOKS:**

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John. P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K. Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.

**EI603PC/EC611PE: OBJECT ORIENTED PROGRAMMING THROUGH JAVA****B.Tech. III Year II Semester**

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

**Prerequisites:** Programming for Problem Solving.**Course Objectives:**

1. Introduces Object Oriented Programming Concepts Using The Java Language
2. Introduces The Principles Of Inheritance And Polymorphism; And Demonstrates How They Relate To The Design Of Abstract Classes.
3. Introduces The Implementation Of Packages And Interfaces.
4. Introduces Exception Handling, Event Handling and Multithreading.
5. Introduces The Design Of Graphical User Interface Using Applets And Swings.

**Course Outcomes:**

1. Develop Applications for Range of Problems Using Object-Oriented Programming Techniques
2. Design Simple Graphical User Interface Applications.

**UNIT - I:**

**Object Oriented Thinking and Java Basics:** Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.

**UNIT - II:**

**Inheritance, Packages and Interfaces:** Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object Class.

Defining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.

**UNIT - III:**

**Exception Handling and Multithreading:** Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.

String Handling, Exploring Java.Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads.

Enumerations, Autoboxing, Annotations, Generics.

**UNIT - IV:**

**Event Handling:** Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.



The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

#### **UNIT - V:**

**Applets:** Concepts of Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.

**Swing:** Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- JApplet, JFrame and JComponent, Icons and Labels, Text Fields, Buttons – The JButton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

#### **TEXT BOOKS:**

1. Java the Complete Reference, 7<sup>th</sup> Edition, Herbert Schildt, TMH.
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education.

#### **REFERENCES:**

1. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons.
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.
3. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
4. An Introduction to Java Programming and Object-Oriented Application Development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, eighth Edition, Pearson Education

**EC612PE: MOBILE COMMUNICATIONS AND NETWORKS****B.Tech. III Year II Semester**

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

**Prerequisites:** Analog and Digital Communications**Course Objectives:**

1. To provide the student with an understanding of the cellular concept, frequency reuse, hand-off strategies.
2. To provide the student with an understanding of Co-channel and Non-Co-Channel interferences.
3. To give the student an understanding of cell coverage for signal and traffic, diversity techniques and channel assignment
4. To give the student an understanding types of handoff.
5. To understand challenges and application of Adhoc wireless Networks.

**Course Outcomes:** Upon completing this course, the student will be able to:

1. Known the evolution of cellular and mobile communication system.
2. The student will be able to understand Co-Channel and Non-Co-Channel interferences.
3. Understand impairments due to multipath fading channel and how to overcome the different fading effects.
4. Familiar with cell coverage for signal and traffic, diversity, techniques, frequency management, Channel assignment and types of handoff.
5. Know the difference between cellular and Adhoc Networks and design goals of MAC Layer protocol.

**UNIT - I**

**Introduction to Cellular Mobile Radio Systems:** Limitations of Conventional Mobile Telephone Systems. Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems. Uniqueness of Mobile Radio Environment-Fading-Tie Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

**Fundamentals of Cellular Radio System Design:** Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in a Omni Directional Antenna System, System Capacity Improving Coverage and Capacity in Cellular Systems-Cell Splitting, Sectoring, Microcell Zone Concept.

**UNIT – II**

**Co-Channel Interference:** Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and their effects, diversity techniques-space diversity, polarization diversity, frequency diversity, time diversity.

**Non Co-Channel Interference:** Adjacent Channel Interference, Near end far end interference, cross talk, effects on coverage and interference by power decrease, antenna height decrease, effects of cell site components.

**UNIT – III**

**Cell Coverage for Signal and Traffic:** Signal Reflections in flat and Hilly Terrain, effects of Human Made Structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, path loss from a point to point prediction model in different conditions, merits of lee model.

**Frequency Management and Channel Assignment:** Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units.

#### **UNIT - IV**

**Handoffs and Dropped Calls:** Handoff Initiation, types of Handoff, Delaying Handoff, advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem handoff, Introduction to Dropped Call Rates and their Evaluation.

#### **UNIT - V**

**Ad Hoc Wireless Networks:** Introduction, Cellular and Ad Hoc wireless Networks, Applications and Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet, MAC Protocols for Ad Hoc Wireless, Introduction, issues in designing AMAC Protocol for Ad Hoc wireless Networks, Design Goals of AMAC protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols.

#### **TEXT BOOKS:**

1. Mobile Cellular Telecommunications-W.C.Y. Lee, Mc Graw Hill, 2<sup>nd</sup> Edn., 1989.
2. Wireless Communications-Theodore. S. Rapport, Pearson Education, 2<sup>nd</sup> Edn., 2002.

#### **REFERENCE BOOKS:**

1. Ad Hoc Wireless Networks: Architectures and Protocols-C. Siva ram Murthy and B.S. Manoj, 2004, PHI.
2. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Education, 2005.
3. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
4. Wireless Communications-Andrea Goldsmith, Cambridge University Press, 2005.

**EC613PE: EMBEDDED SYSTEM DESIGN****B.Tech. III Year II Semester**

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

**Prerequisite:** Microprocessors and Microcontrollers; Computer Organization and Operating Systems**Course Objectives:**

1. To provide an overview of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware.
3. To understand the necessity of operating systems in correlation with hardware systems.
4. To learn the methods of interfacing and synchronization for tasking.

**Course Outcomes:** Upon completing this course, the student will be able to

1. To understand the selection procedure of Processors in the embedded domain.
2. Design Procedure for Embedded Firmware.
3. To visualize the role of Real time Operating Systems in Embedded Systems.
4. To evaluate the Correlation between task synchronization and latency issues

**UNIT - I:**

**Introduction to Embedded Systems:** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

**UNIT - II:**

**Typical Embedded System:** Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

**UNIT - III:**

**Embedded Firmware:** Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

**UNIT - IV:**

**RTOS Based Embedded System Design:** Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

**UNIT - V:**

**Task Communication:** Shared Memory, Message Passing, Remote Procedure Call and Sockets,  
**Task Synchronization:** Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose an RTOS.

**TEXT BOOKS:**

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

**REFERENCE BOOKS:**

2. Embedded Systems - Raj Kamal, TMH.
3. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
4. Embedded Systems – Lyla, Pearson, 2013
5. An Embedded Software Primer - David E. Simon, Pearson Education.

**EC604PC: DIGITAL SIGNAL PROCESSING LAB****B.Tech. III Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

**Note:** - Minimum of 12 experiments has 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.

**EC605PC: e - CAD LAB****B.Tech. III Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Note:** Any **SIX** of the following experiments from each part are to be conducted (Total 12)

**Part - I**

**All the following experiments have to be implemented using HDL**

1. Realize all the logic gates
2. Design of 8-to-3 encoder (without and with priority) and 2-to-4 decoder
3. Design of 8-to-1 multiplexer and 1-to-8 demultiplexer
4. Design of 4 bit binary to gray code converter
5. Design of 4 bit comparator
6. Design of Full adder using 3 modeling styles
7. Design of flip flops: SR, D, JK, T
8. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter
9. Finite State Machine Design

**Part-II**

**Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and crosstalk analysis for the following:**

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/ NAND gates
4. CMOS XOR and MUX gates
5. Static / Dynamic logic circuit (register cell)
6. Latch
7. Pass transistor
8. Layout of any combinational circuit (complex CMOS logic gate).

**EC606PC: SCRIPTING LANGUAGES LAB****B.Tech. III Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Prerequisites:** Any High-level programming language (C, C++)**Course Objectives:**

- To Understand the concepts of scripting languages for developing web-based projects
- To understand the applications the of Ruby, TCL, Perl scripting languages

**Course Outcomes:**

- Ability to understand the differences between Scripting languages and programming languages
- Able to gain some fluency programming in Ruby, Perl, TCL

**List of Experiments**

1. Write a Ruby script to create a new string which is n copies of a given string where n is a non-negative integer
2. Write a Ruby script which accept the radius of a circle from the user and compute the parameter and area.
3. Write a Ruby script which accept the user's first and last name and print them in reverse order with a space between them
4. Write a Ruby script to accept a filename from the user print the extension of that
5. Write a Ruby script to find the greatest of three numbers
6. Write a Ruby script to print odd numbers from 10 to 1
7. Write a Ruby script to check two integers and return true if one of them is 20 otherwise return their sum
8. Write a Ruby script to check two temperatures and return true if one is less than 0 and the other is greater than 100
9. Write a Ruby script to print the elements of a given array
10. Write a Ruby program to retrieve the total marks where subject name and marks of a student stored in a hash
11. Write a TCL script to find the factorial of a number
12. Write a TCL script that multiplies the numbers from 1 to 10
13. Write a TCL script for Sorting a list using a comparison function
14. Write a TCL script to (i)create a list (ii )append elements to the list (iii) Traverse the list (iv)Concatenate the list
15. Write a TCL script to comparing the file modified times.
16. Write a TCL script to Copy a file and translate to native format.
17. a) Write a Perl script to find the largest number among three numbers.  
b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.
18. Write a Perl program to implement the following list of manipulating functions  
a)Shift  
b)Unshift  
c)Push
19. a) Write a Perl script to substitute a word, with another word in a string.  
b) Write a Perl script to validate IP address and email address.
20. Write a Perl script to print the file in reverse order using command line arguments

**\*MC609: ENVIRONMENTAL SCIENCE****B.Tech. III Year II Semester**

<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 Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations

**Course Outcomes:**

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

**UNIT - I**

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT - II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

**UNIT - III**

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

**UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-



economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

**TEXT BOOKS:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech. 1<sup>st</sup> Year Syllabus (w.e.f AY 2018-19)****Common for ECE & EIE****I YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Mathematics - I	3	1	0	4
2	AP102BS	Applied Physics	3	1	0	4
3	CS103ES	Programming for Problem Solving	3	1	0	4
4	ME104ES	Engineering Graphics	1	0	4	3
5	AP105BS	Applied Physics Lab	0	0	3	1.5
6	CS106ES	Programming for Problem Solving Lab	0	0	3	1.5
7	*MC109ES	Environmental Science	3	0	0	0
		Induction Programme				
		<b>Total Credits</b>	<b>13</b>	<b>3</b>	<b>10</b>	<b>18</b>

**I YEAR II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA201BS	Mathematics - II	3	1	0	4
2	CH202BS	Chemistry	3	1	0	4
3	EE203ES	Basic Electrical Engineering	3	0	0	3
4	ME205ES	Engineering Workshop	1	0	3	2.5
5	EN205HS	English	2	0	0	2
6	CH206BS	Engineering Chemistry Lab	0	0	3	1.5
7	EN207HS	English Language and Communication Skills Lab	0	0	2	1
8	EE208ES	Basic Electrical Engineering Lab	0	0	2	1
		<b>Total Credits</b>	<b>12</b>	<b>2</b>	<b>10</b>	<b>19</b>

**\*MC – Satisfied/Unsatisfied**

**MA101BS: MATHEMATICS - I****B.Tech. I Year I Sem.**

L	T	P	C
3	1	0	4

**Course Objectives:** To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Analyse the nature of sequence and series.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.

**UNIT-I: Matrices**

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

**UNIT-II: Eigen values and Eigen vectors**

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

**UNIT-III: Sequences & Series**

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

**UNIT-IV: Calculus**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT-V: Multivariable calculus (Partial Differentiation and applications)**

Definitions of Limit and continuity.

Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

**TEXTBOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.

**REFERENCES:**

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.

**AP102BS/AP202BS: APPLIED PHYSICS****B.Tech. I Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Course Objectives:**

- Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
- Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and Electromagnetic theory and a broad base of knowledge in physics.
- The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
- To study applications in engineering like memory devices, transformer core and electromagnetic machinery.

**Course Outcomes:** Upon graduation:

- The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state.
- The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.
- Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
- The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.

**UNIT-I: Quantum Mechanics**

Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

**UNIT-II: Semiconductor Physics**

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.

**UNIT-III: Optoelectronics**

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photodetectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

**UNIT-IV: Lasers and Fibre Optics**

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO<sub>2</sub>) laser, He-Ne laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

**UNIT-V: Electromagnetism and Magnetic Properties of Materials**

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarisation, Permittivity and Dielectric constant, Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials.

**TEXT BOOKS:**

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learning.
2. Halliday and Resnick, Physics - Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

**REFERENCES:**

1. Richard Robinett, Quantum Mechanics
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL

**CS103ES/CS203ES: PROGRAMMING FOR PROBLEM SOLVING****B.Tech. I Year I Sem.**

L	T	P	C
3	1	0	4

**Course Objectives:**

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

**Course Outcomes:** The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

**Unit - 1: Introduction to Programming**

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments

Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.

Command line arguments

**Unit - II: Arrays, Strings, Structures and Pointers:**

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation)

Enumeration data type

### **Unit - III: Preprocessor and File handling in C:**

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

### **Unit - IV: Function and Dynamic Memory Allocation:**

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

### **Unit - V: Introduction to Algorithms:**

Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number, etc.

Basic searching in an array of elements (linear and binary search techniques),

Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms),

Basic concept of order of complexity through the example programs

### **TEXT BOOKS:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3<sup>rd</sup> Edition)

### **REFERENCE BOOKS:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
2. Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16<sup>th</sup> Impression)
4. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
5. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4<sup>th</sup> Edition



**ME104ES/ME204ES: ENGINEERING GRAPHICS****B.Tech. I Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>4</b>	<b>3</b>

**Pre-requisites:** Nil**Course objectives:**

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

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

- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

**UNIT – I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain & Diagonal.

**UNIT- II**

**Orthographic Projections:** Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

**UNIT – III**

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

**UNIT – IV**

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder

**UNIT – V**

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

**Introduction to CAD: (For Internal Evaluation Weightage only):**

Introduction to CAD Software Package Commands.- Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package

**TEXTBOOKS:**

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

**REFERENCE BOOKS:**

1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

**AP105BS/AP205BS: APPLIED PHYSICS LAB****B.Tech. I Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**List of Experiments:**

1. Energy gap of P-N junction diode:  
To determine the energy gap of a semiconductor diode.
2. Solar Cell:  
To study the V-I Characteristics of solar cell.
3. Light emitting diode:  
Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee's experiment:  
Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect:  
To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect:  
To determine work function of a given material.
7. LASER:  
To study the characteristics of LASER sources.
8. Optical fibre:  
To determine the bending losses of Optical fibres.
9. LCR Circuit:  
To determine the Quality factor of LCR Circuit.
10. R-C Circuit:  
To determine the time constant of R-C circuit.

**Note: Any 8 experiments are to be performed**

**CS106ES/CS206ES: PROGRAMMING FOR PROBLEM SOLVING LAB****B.Tech. I Year I Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

*[Note: The programs may be executed using any available Open Source/ Freely available IDE  
Some of the Tools available are:*

*CodeLite: <https://codelite.org/>*

*Code::Blocks: <http://www.codeblocks.org/>*

*DevCpp : <http://www.bloodshed.net/devcpp.html>*

*Eclipse: <http://www.eclipse.org>*

*This list is not exhaustive and is NOT in any order of preference]*

**Course Objectives:** The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

**Course Outcomes:** The candidate is expected to be able to:

- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

**Practice sessions:**

- Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
- Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

**Simple numeric problems:**

- Write a program for fiend the max and min from the three numbers.
- Write the program for the simple, compound interest.

- c. Write program that declares Class awarded for a given percentage of marks, where mark  $<40\%$  = Failed,  $40\%$  to  $<60\%$  = Second class,  $60\%$  to  $<70\%$  = First class,  $\geq 70\%$  = Distinction. Read percentage from standard input.
- d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
  - e.  $5 \times 1 = 5$
  - f.  $5 \times 2 = 10$
  - g.  $5 \times 3 = 15$
- h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

**Expression Evaluation:**

- a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula  $s = ut + \frac{1}{2}at^2$  where u and a are the initial velocity in m/sec (= 0) and acceleration in  $\text{m/sec}^2$  ( $= 9.8 \text{ m/s}^2$ )).
- b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)
- c. Write a program that finds if a given number is a prime number
- d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
- e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
- g. Write a C program to find the roots of a Quadratic equation.
- h. Write a C program to calculate the following, where x is a fractional value.
  - i.  $1 - x/2 + x^2/4 - x^3/6$
- j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:  $1 + x + x^2 + x^3 + \dots + x^n$ . For example: if n is 3 and x is 5, then the program computes  $1 + 5 + 25 + 125$ .

**Arrays and Pointers and Functions:**

- a. Write a C program to find the minimum, maximum and average in an array of integers.
- b. Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.
- c. Write a C program that uses functions to perform the following:
- d. Addition of Two Matrices
- e. ii. Multiplication of Two Matrices

- f. iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.
- g. Write C programs that use both recursive and non-recursive functions
- h. To find the factorial of a given integer.
- i. ii. To find the GCD (greatest common divisor) of two given integers.
- j. iii. To find  $x^n$
- k. Write a program for reading elements using pointer into array and display the values using array.
- l. Write a program for display values reverse order from array using pointer.
- m. Write a program through pointer variable to sum of n elements from array.

**Files:**

- a. Write a C program to display the contents of a file to standard output device.
- b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
- c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.
- d. Write a C program that does the following:  
It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function)  
Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)  
The program should then read all 10 values and print them back.
- e. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

**Strings:**

- a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
- b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
- c. Write a C program that uses functions to perform the following operations:
- d. To insert a sub-string in to a given main string from a given position.
- e. ii. To delete n Characters from a given position in a given string.
- f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
- g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
- h. Write a C program to count the lines, words and characters in a given text.

**Miscellaneous:**

- a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices

are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

- b. Write a C program to construct a pyramid of numbers as follows:

```

1           *           1           1           *
1 2         * *         2 3         2 2         * *
1 2 3       * * *       4 5 6       3 3 3       * * *
                                     4 4 4 4       * *
                                           *
```

### Sorting and Searching:

- Write a C program that uses non recursive function to search for a Key value in a given
- list of integers using linear search method.
- Write a C program that uses non recursive function to search for a Key value in a given
- sorted list of integers using binary search method.
- Write a C program that implements the Bubble sort method to sort a given list of
- integers in ascending order.
- Write a C program that sorts the given array of integers using selection sort in descending order
- Write a C program that sorts the given array of integers using insertion sort in ascending order
- Write a C program that sorts a given array of names

### Suggested Reference Books for solving the problems:

- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3<sup>rd</sup> Edition)
- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
- R.G. Dromey, How to solve it by Computer, Pearson (16<sup>th</sup> Impression)
- Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
- Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4<sup>th</sup> Edition

**\*MC109ES: ENVIRONMENTAL SCIENCE****B.Tech. I Year I Sem.**

L	T	P	C
3	0	0	0

**Course Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

**Course Outcomes:**

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

**UNIT-I**

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT-II**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

**UNIT-III**

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT-IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics



of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

## UNIT-V

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

## TEXT BOOKS:

- 1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

## REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.

**MA201BS: MATHEMATICS - II****B.Tech. I Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Course Objectives:** To learn

- Methods of solving the differential equations of first and higher order.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

**Course Outcomes:** After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelopiped
- Evaluate the line, surface and volume integrals and converting them from one to another

**UNIT-I: First Order ODE**

Exact, linear and Bernoulli's equations; Applications : Newton's law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

**UNIT-II: Ordinary Differential Equations of Higher Order**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$  and  $xV(x)$ ; method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

**UNIT-III: Multivariable Calculus (Integration)**

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelopiped).

**UNIT-IV: Vector Differentiation**

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

**UNIT-V: Vector Integration**

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

**TEXT BOOKS:**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.

**REFERENCES:**

1. Paras Ram, Engineering Mathematics, 2<sup>nd</sup> Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed., Wiley India, 1984.

**CH102BS/CH202BS: CHEMISTRY****B.Tech. I Year II Sem.**

L	T	P	C
3	1	0	4

**Course Objectives:**

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

**Course Outcomes:** The basic concepts included in this course will help the student to gain:

- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
- The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
- The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

**Unit - I:**

**Molecular structure and Theories of Bonding:** Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N<sub>2</sub>, O<sub>2</sub> and F<sub>2</sub> molecules.  $\pi$  molecular orbitals of butadiene and benzene.

Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

**Unit - II:**

**Water and its treatment:** Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

**Unit - III:**

**Electrochemistry and corrosion:** Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.

**Unit - IV:**

**Stereochemistry, Reaction Mechanism and synthesis of drug molecules:** Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation analysis of n- butane.

Substitution reactions: Nucleophilic substitution reactions: Mechanism of  $S_N1$ ,  $S_N2$  reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using  $KMnO_4$  and chromic acid.

Reduction reactions: reduction of carbonyl compounds using  $LiAlH_4$  &  $NaBH_4$ . Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

**Unit - V:**

**Spectroscopic techniques and applications:** Principles of spectroscopy, selection rules and applications of electronic spectroscopy. vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

**Suggested Text Books:**

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5<sup>th</sup> Edition.
5. University Chemistry, by B.M. Mahan, Pearson IV Edition.
6. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan

**EE103ES/EE203ES: BASIC ELECTRICAL ENGINEERING****B.Tech. I Year II Sem.**

L	T	P	C
3	0	0	3

**Course Objectives:**

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To impart the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

**Course Outcomes:**

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

**UNIT-I: D.C. Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

Time-domain analysis of first-order RL and RC circuits.

**UNIT-II: A.C. Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit.

Three-phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT-III: Transformers**

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

**UNIT-IV: Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor.

Construction and working of synchronous generators.

**UNIT-V: Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**Suggested Text-Books/Reference-Books:**

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
5. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

**ME105ES/ME205ES: ENGINEERING WORKSHOP****B.Tech. I Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>3</b>	<b>2.5</b>

**Pre-requisites:** Practical skill**Course Objectives:**

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

**1. TRADES FOR EXERCISES:****At least two exercises from each trade:**

- I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
- III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
- IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
- V. Welding Practice – ( Arc Welding & Gas Welding)
- VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
- VII. Black Smithy – ( Round to Square, Fan Hook and S-Hook)

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working



**TEXT BOOKS:**

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

**REFERENCE BOOKS:**

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

**EN105HS/EN205HS: ENGLISH****B.Tech. I Year II Sem.**

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

**INTRODUCTION**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. *The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.*

**Learning Objectives:** The course will help to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.

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

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

**SYLLABUS****UNIT –I**

**‘The Raman Effect’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

**Vocabulary Building:** The Concept of Word Formation --The Use of Prefixes and Suffixes.

**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading:** Reading and Its Importance- Techniques for Effective Reading.

**Basic Writing Skills:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

## UNIT –II

**‘Ancient Architecture in India’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

**Vocabulary:** Synonyms and Antonyms.

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

**Reading:** Improving Comprehension Skills – Techniques for Good Comprehension

**Writing:** Format of a Formal Letter-**Writing Formal Letters** E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume.

## UNIT –III

**‘Blue Jeans’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

**Vocabulary:** Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

**Reading:** Sub-skills of Reading- Skimming and Scanning

**Writing:** Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying-** Providing Examples or Evidence

## UNIT –IV

**‘What Should You Be Eating’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

**Vocabulary:** Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in Oral and Written Communication.

**Reading:** Comprehension- Intensive Reading and Extensive Reading

**Writing: Writing Practices--**Writing Introduction and Conclusion - Essay Writing-Précis Writing.

## UNIT –V

**‘How a Chinese Billionaire Built Her Fortune’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

**Vocabulary:** Technical Vocabulary and their usage

**Grammar:** Common Errors in English

**Reading:** Reading Comprehension-Exercises for Practice

**Writing: Technical Reports-** Introduction – Characteristics of a Report – Categories of Reports

Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing aReport.

**Prescribed Textbook:**

1. **Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.**

**References:**

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

**CH106BS/CH206BS: ENGINEERING CHEMISTRY LAB****B.Tech. I Year II Sem.**

L	T	P	C
0	0	3	1.5

**Course Objectives:** The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- To determine the rate constant of reactions from concentrations as a function of time.
- The measurement of physical properties like adsorption and viscosity.
- To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

**Course Outcomes:** The experiments will make the student gain skills on:

- Determination of parameters like hardness and chloride content in water.
- Estimation of rate constant of a reaction from concentration – time relationships.
- Determination of physical properties like adsorption and viscosity.
- Calculation of  $R_f$  values of some organic molecules by TLC technique.

**List of Experiments:**

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of  $\text{Fe}^{2+}$  by Potentiometry using  $\text{KMnO}_4$
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of  $R_f$  values. eg ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.
14. Determination of surface tension of a given liquid using stalagmometer.

**References**

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5<sup>th</sup> edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

**EN107HS/EN207HS: ENGLISH LANGUAGE  
AND COMMUNICATION SKILLS LAB**

**B.Tech. I Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

**Course Objectives:**

- ✎ To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- ✎ To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- ✎ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✎ To improve the fluency of students in spoken English and neutralize their mother tongue influence
- ✎ To train students to use language appropriately for public speaking and interviews

**Learning Outcomes:** Students will be able to attain

- 👍 Better understanding of nuances of English language through audio- visual experience and group activities
- 👍 Neutralization of accent for intelligibility
- 👍 Speaking skills with clarity and confidence which in turn enhances their employability skills

**Syllabus**

**English Language and Communication Skills Lab (ELCS) shall have two parts:**

- a. Computer Assisted Language Learning (CALL) Lab**
- b. Interactive Communication Skills (ICS) Lab**

**Listening Skills****Objectives**

1. To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

## Speaking Skills

### Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
  - Oral practice: Just A Minute (JAM) Sessions
  - Describing objects/situations/people
  - Role play – Individual/Group activities

- **The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab)**

### Exercise – I

#### CALL Lab:

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

*Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

#### ICS Lab:

*Understand:* Communication at Work Place- Spoken vs. Written language.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

### Exercise – II

#### CALL Lab:

*Understand:* Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

#### ICS Lab:

*Understand:* Features of Good Conversation – Non-verbal Communication.

*Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

### Exercise - III

#### CALL Lab:

*Understand:* Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

**ICS Lab:**

*Understand:* How to make Formal Presentations.

*Practice:* Formal Presentations.

**Exercise – IV****CALL Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests.

**ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks.

*Practice:* Making a Short Speech – Extempore.

**Exercise – V****CALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests.

**ICS Lab:**

*Understand:* Interview Skills.

*Practice:* Mock Interviews.

\*\*\*\*\*

**Minimum Requirement of infrastructural facilities for ELCS Lab:****1. Computer Assisted Language Learning (CALL) Lab:**

**The Computer Assisted Language Learning Lab** has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

**System Requirement (Hardware component):**

*Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:*

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

**2. Interactive Communication Skills (ICS) Lab:**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.



**EE108ES/EE208ES: BASIC ELECTRICAL ENGINEERING LAB****B.Tech. I Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Course Objectives:**

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

**Course Outcomes:**

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

**List of experiments/demonstrations:**

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

With effect from 02/08/2016

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B.Tech COURSE STRUCTURE (2016-17)**

(Common for EEE, ECE, CSE, EIE, BME, IT, ETE, ECM, ICE)

**I YEAR I SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Mathematics-I	3	1	0	3
2	CH102BS	Engineering Chemistry	4	0	0	4
3	PH103BS	Engineering Physics-I	3	0	0	3
4	EN104HS	Professional Communication in English	3	0	0	3
5	ME105ES	Engineering Mechanics	3	0	0	3
6	EE106ES	Basic Electrical and Electronics Engineering	4	0	0	4
7	EN107HS	English Language Communication Skills Lab	0	0	3	2
8	ME108ES	Engineering Workshop	0	0	3	2
9	*EA109MC	NSS	0	0	0	0
		<b>Total Credits</b>	<b>20</b>	<b>1</b>	<b>6</b>	<b>24</b>

**I YEAR II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	PH201BS	Engineering Physics-II	3	0	0	3
2	MA202BS	Mathematics-II	4	1	0	4
3	MA203BS	Mathematics-III	4	1	0	4
4	CS204ES	Computer Programming in C	3	0	0	3
5	ME205ES	Engineering Graphics	2	0	4	4
6	CH206BS	Engineering Chemistry Lab	0	0	3	2
7	PH207BS	Engineering Physics Lab	0	0	3	2
8	CS208ES	Computer Programming in C Lab	0	0	3	2
9	*EA209MC	NCC/NSO	0	0	0	0
		<b>Total Credits</b>	<b>16</b>	<b>2</b>	<b>13</b>	<b>24</b>

\*Mandatory Course.

**MATHEMATICS- I**  
**(Linear Algebra and Differential Equations)**

**B.Tech. I Year I Sem.**

Course Code: **MA101BS**

**L T/P/D C**

**3 1/0/0 3**

**Prerequisites:** Foundation course (No prerequisites).

**Course Objectives:**

To learn

- types of matrices and their properties
- the concept of rank of a matrix and applying the same to understand the consistency
- solving the linear systems
- the concepts of eigen values and eigen vectors and reducing the quadratic forms into their canonical forms
- partial differentiation, concept of total derivative
- finding maxima and minima of functions of two variables
- methods of solving the linear differential equations of first and higher order
- the applications of the differential equations
- formation of the partial differential equations and solving the first order equations.

**Course Outcomes:**

After learning the contents of this paper the student must be able to

- write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
- find the Eigen values and Eigen vectors which come across under linear transformations
- find the extreme values of functions of two variables with/ without constraints.
- identify whether the given first order DE is exact or not
- solve higher order DE's and apply them for solving some real world problems

**UNIT-I**

**Initial Value Problems and Applications**

Exact differential equations - Reducible to exact.

Linear differential equations of higher order with constant coefficients: Non homogeneous terms with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$ ,  $xV(x)$ - Operator form of the differential equation, finding particular integral using inverse operator, Wronskian of functions, method of variation of parameters.

Applications: Newton's law of cooling, law of natural growth and decay, orthogonal trajectories, Electrical circuits.

**UNIT-II**

**Linear Systems of Equations**

Types of real matrices and complex matrices, rank, echelon form, normal form, consistency and solution of linear systems (homogeneous and Non-homogeneous) - Gauss elimination, Gauss Jordan and LU decomposition methods- Applications: Finding current in the electrical circuits.

### **UNIT–III**

#### **Eigen values, Eigen Vectors and Quadratic Forms**

Eigen values, Eigen vectors and their properties, Cayley - Hamilton theorem (without proof), Inverse and powers of a matrix using Cayley - Hamilton theorem, Diagonalization, Quadratic forms, Reduction of Quadratic forms into their canonical form, rank and nature of the Quadratic forms – Index and signature.

### **UNIT–IV**

#### **Partial Differentiation**

Introduction of partial differentiation, homogeneous function, Euler's theorem, total derivative, Chain rule, Taylor's and McLaurin's series expansion of functions of two variables, functional dependence, Jacobian.

Applications: maxima and minima of functions of two variables without constraints and Lagrange's method (with constraints)

### **UNIT-V**

#### **First Order Partial Differential Equations**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, Lagranges method to solve the first order linear equations and the standard type methods to solve the non linear equations.

#### **Text Books:**

1. A first course in differential equations with modeling applications by Dennis G. Zill, Cengage Learning publishers.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.

#### **References:**

1. Advanced Engineering Mathematics by E. Kreyszig, John Wiley and Sons Publisher.
2. Engineering Mathematics by N. P. Bali, Lakshmi Publications.

## ENGINEERING CHEMISTRY

**B.Tech. I Year I Sem.**

Course Code: **CH102BS/CH202BS**

**L T/P/D C**

**4 0/0/0 4**

### **Course Objectives:**

- 1) To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- 2) To include the importance of water in industrial usage, significance of corrosion control to protect the structures, polymers and their controlled usage.
- 3) To acquire knowledge of engineering materials and about fuels and batteries.
- 4) To acquire required knowledge about engineering materials like cement, refractories and composites.

### **Course Outcomes:**

Students will gain the basic knowledge of electrochemical procedures related to corrosion and its control. They can understand the basic properties of water and its usage in domestic and industrial purposes. They learn the use of fundamental principles to make predictions about the general properties of materials. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

## **UNIT-I**

**Water and its treatment:** Introduction – hardness of water – causes of hardness – types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Numerical problems. Potable water and its specifications- Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and Ozonization. Defluoridation – Nalgonda technique - Determination of F<sup>-</sup> ion by ion- selective electrode method.

### **Boiler troubles:**

Sludges, scales and Caustic embrittlement. Internal treatment of Boiler feed water – Calgon conditioning – Phosphate conditioning - Colloidal conditioning – Softening of water by ion-exchange processes. Desalination of water – Reverse osmosis. Numerical problems – Sewage water - Steps involved in treatment of sewage.

## **UNIT-II**

### **Electrochemistry and Batteries:**

**Electrochemistry:** Electrode- electrode potential, standard electrode potential, types of electrodes – Construction and functioning of Standard hydrogen electrode, calomel and glass electrode. Nernst equation - electrochemical series and its applications. Electrochemical cells: Daniel cell – cell notation, cell reaction and cell emf -- Concept of concentration cells – Electrolyte concentration cell – Numerical problems.

**Batteries:** Cell and battery - Primary battery (dry cell, alkaline cell and Lithium cell) and Secondary battery (lead acid, Ni-Cd and lithium ion cell),

**Fuel cells:** Hydrogen –oxygen and methanol-oxygen fuel cells – Applications.

### UNIT-III

**Polymers:** Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples.

**Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, compounding and fabrication of plastics (compression and injection moulding). Preparation, Properties and engineering applications of PVC and Bakelite.

**Fibers:** Characteristics of fibers – preparation, properties and applications of Nylon-6, 6 and Dacron. Fiber reinforced plastics (FRP) – Applications.

**Rubbers:** Natural rubber and its vulcanization - compounding of rubber.

**Elastomers:** Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

**Conducting polymers:** Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

**Biodegradable polymers:** Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

### UNIT-IV

**Fuels and Combustion:** Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG.

**Combustion:** Definition, Calorific value of fuel – HCV, LCV; Calculation of air quantity required for combustion of a fuel.

### UNIT-V

#### **Cement, Refractories, Lubricants and Composites:**

**Cement:** Portland cement, its composition, setting and hardening of Portland cement.

**Special cements:** White cement, water proof cement, High alumina cement and Acid resistant cement.

**Refractories:** Classification, characteristics of good refractories, Refractoriness, refractoriness under load, porosity and chemical inertness – applications of refractories.

**Lubricants:** Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

**Composites:** Introduction- Constituents of composites – advantages, classification and constituents of composites. Applications of composites.

#### **Text books:**

- 1) Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, New Delhi (2010)
- 2) Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, New Delhi. (2016)

**Reference Books:**

- 1) Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
- 2) Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)
- 3) Engineering Chemistry by Thirumala Chary and Laxminarayana, Scitech Publishers, Chennai (2016).

## ENGINEERING PHYSICS/ENGINEERING PHYSICS - I

**B.Tech. I Year I Sem.**  
Course Code: **PH103BS**

**L T/P/D C**  
**3 0/0/0 3**

### Course Objectives:

- To understand interaction of light with matter through interference, diffraction and polarization.
- To able to distinguish ordinary light with a laser light and to realize propagation of light through optical fibers.
- To understand various crystal systems and there structures elaborately.
- To study various crystal imperfections and probing methods like X-RD.

**Course outcomes:** after completion of this course the student is able to

- Realize the importance of light phenomena in thin films and resolution.
- Learn principle, working of various laser systems and light propagation through optical fibers.
- Distinguish various crystal systems and understand atomic packing factor.
- Know the various defects in crystals.

### UNIT-I

**Interference:** Coherence, division of amplitude and division of wave front, interference in thin films (transmitted and reflected light), Newton's rings experiment.

**Diffraction:** Distinction between Fresnel and Fraunhofer diffraction, diffraction due to single slit, N-slits, Diffraction grating experiment.

### UNIT-II

**Polarization:** Introduction, Malus's law, double refraction, Nicol prism, Quarter wave and half wave plates.

**Lasers:** Characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein coefficients, population inversion, ruby laser, helium – neon laser, semi conductor laser, applications of lasers

### UNIT-III

**Fiber Optics:** Principle of optical fiber, construction of fiber, acceptance angle and acceptance cone, numerical aperture, types of optical fibers: step index and graded index fibers, attenuation in optical fibers, applications of optical fibers in medicine and sensors.

### UNIT-IV

**Crystallography:** Space lattice, unit cell and lattice parameters, crystal systems, Bravais lattices, atomic radius, co-ordination number and packing factor of SC, BCC, FCC, HCP and diamond, Miller indices, crystal planes and directions, inter planar spacing of orthogonal crystal systems.

### UNIT-V

**X-ray Diffraction and Defects in Crystals:** Bragg's law, X-ray diffraction methods: Laue method, powder method; point defects: vacancies, substitutional, interstitial, Frenkel and



Schottky defects, line defects (qualitative) and Burger's vector, surface defects: stacking faults, twin, tilt and grain boundaries.

**Text Books:**

1. Physics Vol. 2, Halliday, Resnick and Kramer John Wiley and Sons, Edition 4.
2. Modern Engineering Physics, K. Vijaya Kumar and S. Chandra Lingam, S. Chand and Co. Pvt. Ltd.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Student edition.

**Reference Books:**

1. X-Ray Crystallography, Phillips, John Wiley publishers.
2. Waves, Frank S Crawford Jr, Berkeley Physics course, Volume 3.
3. Solid State Physics, AJ Dekker, MacMillan Publishers.
4. Introduction to Crystallography, Phillips, John Wiley publishers.

## PROFESSIONAL COMMUNICATION IN ENGLISH

**B.Tech. I Year I Sem.**

Course Code: **EN104HS/EN204HS**

**L T/P/D C**

**3 0/0/0 3**

### INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic and communicative competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text book for detailed study. The students should be encouraged to read the texts/poems silently leading to reading comprehension. Reading comprehension passages are given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, from newspaper articles, advertisements, promotional material, etc. *The focus in this syllabus is on skill development, fostering ideas and practice of language skills.*

### Course Objectives:

The course will help students to:

- a. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- b. Equip students to study academic subjects more effectively using the theoretical and Practical components of English syllabus.
- c. Develop study skills and communication skills in formal and informal situations.

### Course Outcomes:

Students will be able to:

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in formal and informal contexts.

### SYLLABUS

#### Reading Skills:

#### Objectives:

1. To develop an awareness in students about the significance of silent reading and comprehension.
2. To develop students' ability to guess meanings of words from the context and grasp the overall message of the text, draw inferences, etc., by way of:
  - Skimming and Scanning the text
  - Intensive and Extensive Reading
  - Reading for Pleasure
  - Identifying the topic sentence

- Inferring lexical and contextual meaning
- Recognizing Coherence/Sequencing of Sentences

**NOTE:** The students will be trained in reading skills using the prescribed texts for detailed study. They will be tested in reading comprehension of different ‘unseen’ passages which may be taken from authentic texts, such as magazines/newspaper articles.

### **Writing Skills:**

#### **Objectives:**

1. To develop an awareness in the students about writing as an exact and formal skill
2. To create an awareness in students about the components of different forms of writing, beginning with the lower order ones through;
  - Writing of sentences
  - Use of appropriate vocabulary
  - Paragraph writing
  - Coherence and cohesiveness
  - Narration / description
  - Note Making
  - Formal and informal letter writing
  - Describing graphs using expressions of comparison

In order to improve the proficiency of the students in the acquisition of language skills mentioned above, the following text and course contents, divided into Five Units, are prescribed:

#### **Text Books:**

1. *“Fluency in English – A Course book for Engineering Students”* by Board of Editors: **Hyderabad: Orient BlackSwan Pvt. Ltd. 2016. Print.**
2. Raman, Meenakshi and Sharma, Sangeeta. *“Technical Communication- Principles and Practice”*. **Third Edition. New Delhi: Oxford University Press. 2015. Print.**

The course content / study material is divided into **Five Units**.

**Note:** *Listening and speaking skills are covered in the syllabus of ELCS Lab.*

#### **UNIT –I:**

Chapter entitled ‘*Presidential Address*’ by **Dr. A.P.J. Kalam** from *“Fluency in English– A Course book for Engineering Students”* published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Word Formation -- Root Words --The Use of Prefixes and Suffixes-- Collocations-- Exercises for Practice.

**Grammar:** Punctuation – Parts of Speech- Articles -Exercises for Practice.

**Reading:** *Double Angels* by David Scott-Reading and Its Importance- Techniques for Effective Reading- Signal Words- Exercises for Practice

**Writing:** Writing Sentences- Techniques for Effective Writing-- Paragraph Writing- Types, Structure and Features of a Paragraph-Coherence and Cohesiveness: Logical, Lexical and Grammatical Devices - Exercises for Practice

## UNIT –II:

Chapter entitled *Satya Nadella: Email to Employees on his First Day as CEO* from “*Fluency in English– A Course book for Engineering Students*” Published by Orient BlackSwan, Hyderabad.

- Vocabulary:** Synonyms and Antonyms – Homonyms, Homophones, Homographs- Exercises for Practice (Chapter 17 ‘*Technical Communication- Principles and Practice*’. *Third Edition* published by Oxford University Press may also be followed.)
- Grammar:** Verbs-Transitive, Intransitive and Non-finite Verbs – Mood and Tense— Gerund – Words with Appropriate Prepositions – Phrasal Verbs - Exercises for Practice
- Reading:** Sub-skills of Reading- Skimming, Scanning, Extensive Reading and Intensive Reading - *The Road Not Taken* by **Robert Frost** -- Exercises for Practice
- Writing:** Letter Writing –Format, Styles, Parts, Language to be used in Formal Letters- Letter of Apology – Letter of Complaint-Letter of Inquiry with Reply – Letter of Requisition -- Exercises for Practice

## UNIT –III:

From the book entitled ‘*Technical Communication- Principles and Practice*’. *Third Edition* published by Oxford University Press.

- Vocabulary:** Introduction- A Brief History of Words – Using the Dictionary and Thesaurus– Changing Words from One Form to Another – Confusables (From Chapter 17 entitled ‘*Grammar and Vocabulary Development*’)
- Grammar:** Tenses: Present Tense- Past Tense- Future Tense- Active Voice – Passive Voice- Conditional Sentences – Adjective and Degrees of Comparison. (From Chapter 17 entitled ‘*Grammar and Vocabulary Development*’)
- Reading:** Improving Comprehension Skills – Techniques for Good Comprehension- Skimming and Scanning- Non-verbal Signals – Structure of the Text – Structure of Paragraphs – Punctuation – Author’s viewpoint (Inference) – Reader Anticipation: Determining the Meaning of Words – Summarizing- Typical Reading Comprehension Questions. (From Chapter 10 entitled ‘*Reading Comprehension*’)
- Writing:** Introduction- Letter Writing-Writing the Cover Letter- Cover Letters Accompanying Resumes- Emails. (From Chapter 15 entitled ‘*Formal Letters, Memos, and Email*’)

## UNIT –IV:

Chapter entitled ‘*Good Manners*’ by **J.C. Hill** from *Fluency in English – A Course book for Engineering Students*” published by Orient Blackswan, Hyderabad.

- Vocabulary:** Idiomatic Expressions –One- word Substitutes --- Exercises for Practice (Chapter 17 ‘*Technical Communication- Principles and Practice*’. *Third Edition* published by Oxford University Press may also be followed.)
- Grammar:** Sequence of Tenses- Concord (Subject in Agreement with the Verb) – Exercises for Practice
- Reading:** ‘*If*’ poem by **Rudyard Kipling**--Tips for Writing a Review --- Author’s Viewpoint – Reader’s Anticipation-- Herein the Students will be required to Read and Submit a Review of a Book (Literary or Non-literary) of their choice – Exercises for Practice.

**Writing:** Information Transfer-Bar Charts-Flow Charts-Tree Diagrams etc., -- Exercises for Practice.  
Introduction - Steps to Effective Precis Writing – Guidelines- Samples (Chapter 12 entitled ‘*The Art of Condensation*’ from ***Technical Communication- Principles and Practice. Third Edition*** published by Oxford University Press)

#### **UNIT –V:**

Chapter entitled ‘*Father Dear Father*’ by **Raj Kinger** from ***Fluency in English – A Course book for Engineering Students***” Published by Orient BlackSwan, Hyderabad

**Vocabulary:** Foreign Words—Words borrowed from other Languages- Exercises for Practice

**Grammar:** Direct and Indirect Speech- Question Tags- Exercises for Practice

**Reading:** Predicting the Content- Understanding the Gist – SQ3R Reading Technique- Study Skills – Note Making - Understanding Discourse Coherence – Sequencing Sentences. (From Chapter 10 entitled ‘**Reading Comprehension**’ - ***Technical Communication- Principles and Practice. Third Edition*** published by Oxford University Press.)

**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports –Formats- Prewriting – Structure of Reports (Manuscript Format) - Types of Reports - Writing the Report. (From Chapter 13 entitled ‘**Technical Reports**’ - ***Technical Communication- Principles and Practice. Third Edition*** published by Oxford University Press.)

 **Exercises from both the texts not prescribed shall be used for classroom tasks.**

#### **References**

1. Green, David. *Contemporary English Grammar –Structures and Composition*. MacMillan India. 2014 (Print)
2. Rizvi, M. Ashraf. *Effective Technical Communication*. Tata Mc Graw –Hill. 2015 (Print).

## ENGINEERING MECHANICS

**B.Tech. I Year I Sem.**  
**Course Code: ME105ES**

**L T/P/D C**  
**3 0/0/0 3**

**Pre Requisites:** None

### **Course Objectives:**

- To understand the resolving forces and moments for a given force system
- To analyze the types of friction for moving bodies and problems related to friction.
- To determine the centroid and second moment of area

### **UNIT-I**

**Introduction to Mechanics:** Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

### **UNIT-II**

**Friction:** Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions - Motion of Bodies –Wedge Screw, Screw-jack and differential screw –jack.

### **UNIT-III**

**Centroid and Center of Gravity:** Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity of Bodies – Centroids of Volumes – Center of gravity of composite bodies.

**Area moments of Inertia:** Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration. Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures, Product of Inertia, Transfer Formula for Product of Inertia.

### **UNIT-IV**

**Mass Moment of Inertia:** Introduction - Moment of Inertia of Masses – Radius of gyration - Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies.

**Virtual Work:** Theory of virtual work-Application.

### **UNIT-V**

**Kinetics:** Kinetics of a particle-D'Alemberts principle-Motion in a curved path – work, energy and power. Principle of conservation of energy- Kinetics of rigid body in translation, rotation-work done-Principle of work-energy-Impulse-momentum.

**Mechanical Vibrations:** Definitions, Concepts-Simple Harmonic motion- free vibrations-Simple and compound pendulums

### **Text Books:**

1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy, J. Suresh Kumar/ BSP

2. Engineering Mechanics/ Irving Shames, G. Krishna Mohan Rao / Prentice Hall
3. Foundations and applications of Engineering Mechanics by HD Ram and AK Chouhan, Cambridge publications.

**References:**

1. A Text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain / Academic Publishing Company
2. Engineering Mechanics / Bhattacharyya/ Oxford.

## BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

**B.Tech. I Year I Sem.**

**Course Code: EE106ES/EE205ES:**

**L T/P/D C**

**4 0/0/0 4**

**Pre-requisite: None**

**Course Objectives:** Objectives of this course are

- To introduce the concept of electrical circuits and its components
- To introduce the concepts of diodes and transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

**Course Outcomes:** After this course, the student will be able

- To analyze and solve problems of electrical circuits using network laws and theorems.
- To identify and characterize diodes and various types of transistors.

### UNIT- I

**Electrical Circuits:** R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Source Transformation – V-I relationship for passive elements, Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Nodal Analysis,

**Single Phase AC Circuits:** R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation.

### UNIT-II

**Resonance:** Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.

**Network Theorems:** Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Tellegen's, Millman's and Compensation theorems for DC and AC excitations.

### UNIT- III

**P-N Junction Diode:** Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.

**Rectifiers and Filters:** P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, - section Filters.

### UNIT- IV

**Bipolar Junction Transistor (BJT):** Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations.

Transistor Biasing And Stabilization - Operating point, DC and AC load lines, Biasing - Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias



stability, Stabilization against variations in  $V_{BE}$  and  $\beta$ , Bias Compensation using Diodes and Transistors.

**Transistor Configurations:** BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

## UNIT- V

**Junction Field Effect Transistor:** Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET.

**Special Purpose Devices:** Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

## Text books:

- 1) Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
- 2) Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath Mc Graw Hill Education

## References:

- 1) Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9<sup>th</sup> Ed, 2006.
- 2) Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabratajit, TMH, 2/e, 1998.
- 3) Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6<sup>th</sup> edition.
- 4) Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2<sup>nd</sup> edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
- 5) Network Theory by N. C. Jagan and C. Lakshminarayana, B.S. Publications.
- 6) Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

## ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB

**B.Tech. I Year I Sem.**

Course Code: **EN107HS/EN207HS**

**L T/P/D C**

**0 0/3/0 2**

The **English Language Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

### **Course Objectives:**

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking, group discussions and interviews

### **Course Outcomes:**

Students will be able to attain:

- Better understanding of nuances of English language through audio- visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking skills with clarity and confidence which in turn enhances their employability skills.

**Syllabus: English Language Communication Skills Lab (ELCS) shall have two parts:**

- **Computer Assisted Language Learning (CALL) Lab**
- **Interactive Communication Skills (ICS) Lab**

### **Listening Skills:**

Objectives

- To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
- To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions.

*Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

## **Speaking Skills:**

### **Objectives**

- To involve students in speaking activities in various contexts
- To enable students express themselves fluently and appropriately in social and professional contexts :
  - Oral practice
  - Describing objects/situations/people
  - Role play – Individual/Group activities
  - Just A Minute (JAM) Sessions.

The following course content is prescribed for the **English Language Communication Skills Lab**.

### **Exercise – I**

#### **CALL Lab:**

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.

*Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker.

*Testing Exercises*

#### **ICS Lab:**

*Understand:* Spoken vs. Written language- Formal and Informal English.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

### **Exercise – II**

#### **CALL Lab:**

*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Sentence Stress – Intonation.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Sentence Stress – Intonation.

*Testing Exercises*

#### **ICS Lab:**

*Understand:* Features of Good Conversation – Strategies for Effective Communication.

*Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

### **Exercise - III**

#### **CALL Lab:**

*Understand:* Errors in Pronunciation-the Influence of Mother Tongue (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences between British and American Pronunciation.

### *Testing Exercises*

#### **ICS Lab:**

*Understand:* Descriptions- Narrations- Giving Directions and Guidelines.

*Practice:* Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

#### **Exercise – IV**

#### **CALL Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests.

### *Testing Exercises*

#### **ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

*Practice:* Making a Short Speech – Extempore- Making a Presentation.

#### **Exercise – V**

#### **CALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests.

### *Testing Exercises*

#### **ICS Lab:**

*Understand:* Group Discussion- Interview Skills.

*Practice:* Group Discussion- Mock Interviews.

### **Minimum Requirement of infrastructural facilities for ELCS Lab:**

#### **1. Computer Assisted Language Learning (CALL) Lab:**

**The Computer Assisted Language Learning Lab** has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

#### **System Requirement (Hardware component):**

*Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:*

Computers with Suitable Configuration

High Fidelity Headphones

#### **2. Interactive Communication Skills (ICS) Lab:**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio and video system and camcorder etc.

**Lab Manuals:**

- 1) A book entitled “*ELCS Lab Manual – A Workbook for CALL and ICS Lab Activities*” by Board of Editors: Hyderabad: Orient BlackSwan Pvt. Ltd. 2016. Print.
- 2) Hart, Steve; Nair, Aravind R.; Bhambhani, Veena. “*EMBARK- English for undergraduates*” Delhi: Cambridge University Press. 2016. Print.

**Suggested Software:**

- 1) Cambridge Advanced Learners’ English Dictionary with CD.
- 2) Grammar Made Easy by Darling Kindersley.
- 3) Punctuation Made Easy by Darling Kindersley.
- 4) Oxford Advanced Learner’s Compass, 8<sup>th</sup> Edition.
- 5) English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- 6) English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- 7) TOEFL and GRE (KAPLAN, AARCO and BARRONS, USA, Cracking GRE by CLIFFS).

**References:**

- 1) Jayashree Mohanraj. *Let Us Hear Them Speak*. New Delhi: Sage Texts. 2015. Print.  
Hancock, M. *English Pronunciation in Use. Intermediate Cambridge*: Cambridge University Press. 2009. Print.

## ENGINEERING WORKSHOP

**B.Tech. I Year I Sem.**

Course Code: **ME108ES/ME208ES**

**L T/P/D C**

**0 0/3/0 2**

**Pre-requisites:** Practical skill

### **Course Objective:**

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

### **1. TRADES FOR EXERCISES:**

**At least two exercises from each trade:**

- 1) Carpentry
- 2) Fitting
- 3) Tin-Smithy and Development of jobs carried out and soldering.
- 4) Black Smithy
- 5) House-wiring
- 6) Foundry
- 7) Welding
- 8) Power tools in construction, wood working, electrical engineering and mechanical engineering.

### **2. TRADES FOR DEMONSTRATION and EXPOSURE:**

- Plumbing, Machine Shop, Metal Cutting (Water Plasma)

### **Text books:**

- 1) Workshop Practice /B. L. Juneja / Cengage
- 2) Workshop Manual / K.Venugopal / Anuradha.

### **Reference books:**

- 1) Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech
- 2) Workshop Manual / Venkat Reddy/ BSP

w. e. f. AY 2016-17

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B.Tech COURSE STRUCTURE (2016-17)**

(Common for EEE, ECE, CSE, EIE, BME, IT, ETE, ECM, ICE)

**I YEAR II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	PH201BS	Engineering Physics-II	3	0	0	3
2	MA202BS	Mathematics-II	4	1	0	4
3	MA203BS	Mathematics-III	4	1	0	4
4	CS204ES	Computer Programming in C	3	0	0	3
5	ME205ES	Engineering Graphics	2	0	4	4
6	CH206BS	Engineering Chemistry Lab	0	0	3	2
7	PH207BS	Engineering Physics Lab	0	0	3	2
8	CS208ES	Computer Programming in C Lab	0	0	3	2
9	*EA209MC	NCC/NSO	0	0	0	0
		<b>Total Credits</b>	<b>16</b>	<b>2</b>	<b>13</b>	<b>24</b>

\*Mandatory Course.

## PH201BS: ENGINEERING PHYSICS - II

**B.Tech. I Year II Sem.**

**L T/P/D C**  
**3 0/0/0 3**

### **Course Objectives:**

- To understand the behavior of a particle quantum mechanically.
- To be able to distinguish pure and impure semi conductors and understand formation of P-N Junction.
- To understand various magnetic and dielectric properties of materials.
- To study super conductor behavior of materials.

**Course Outcomes:** After completion of this course the student is able to

- Realize the importance of behavior of a particle quantum mechanically.
- Learn concentration estimation of charge carriers in semi conductors.
- Learn various magnetic dielectric properties and apply them in engineering applications.
- Know the basic principles and applications of super conductors.

### **UNIT - I**

**Principles of Quantum Mechanics:** Waves and particles, de-Broglie hypothesis, matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, Schrodinger time independent wave equation, physical significance of wave function, particle in 1-D potential box, electron in periodic potential, Kronig-Penny model (qualitative treatment), E-K curve, origin of energy band formation in solids.

### **UNIT - II**

**Semiconductor Physics:** Fermi level in intrinsic and extrinsic semiconductors, calculation of carrier concentration in intrinsic & extrinsic semiconductors, direct and indirect band gap semiconductors, formation of PN junction, open circuit PN junction, energy diagram of PN junction diode, solar cell: I-V characteristics and applications.

### **UNIT - III**

**Dielectric Properties:** Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic, ionic and orientation polarizations and calculation of their polarizabilities, internal field, Clausius-Mossotti relation, Piezoelectricity, pyroelectricity and ferroelectricity-BaTiO<sub>3</sub> structure.

### **UNIT - IV**

**Magnetic Properties & Superconductivity:** Permeability, field intensity, magnetic field induction, magnetization, magnetic susceptibility, origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, hysteresis curve based on domain theory, soft and hard magnetic materials, properties of anti-ferro and ferri magnetic materials,

**Superconductivity:** Superconductivity phenomenon, Meissner effect, applications of superconductivity.



## **UNIT - V**

**Introduction to nanoscience:** Origin of nanoscience, nanoscale, surface to volume ratio, quantum confinement, dominance of electromagnetic forces, random molecular motion, bottom-up fabrication: Sol-gel, CVD and PVD techniques, top-down fabrication: ball mill method, characterization by XRD, SEM and TEM.

### **Text Books:**

1. Solid State Physics, A. J. Dekkar, Macmillan publishers Ind. Ltd.,
2. Solid State Physics, Chales Kittel, Wiley student edition.
3. Fundamentals of Physics, Alan Giambattisa, BM Richardson and Robert C Richardson, Tata McGraw hill Publishers.

### **Reference Books:**

1. Modern Engineering Physics, K. Vijaya Kumar, S. Chandralingam S. Chand & Co. Pvt. Ltd.,
2. University Physics, Francis W. Sears, Hugh D. Young, Marle Zeemansky and Roger A Freedman, Pearson Education.
3. Fundamentals of Acoustics, Kinster and Frey, John Wiley and Sons.
4. Introduction to Quantum Mechanics Leonard I. Schiff McGraw-Hill

**MA102BS/MA202BS: MATHEMATICS - II**  
**(Advanced Calculus)**

**B.Tech. I Year II Sem.**

**L T/P/D C**  
**4 1/0/0 4**

**Prerequisites:** Foundation course (No prerequisites).

**Course Objectives:** To learn

- concepts & properties of Laplace Transforms
- solving differential equations using Laplace transform techniques
- evaluation of integrals using Beta and Gamma Functions
- evaluation of multiple integrals and applying them to compute the volume and areas of regions
- the physical quantities involved in engineering field related to the vector valued functions.
- the basic properties of vector valued functions and their applications to line, surface and volume integrals.

**Course Outcomes:** After learning the contents of this course the student must be able to

- use Laplace transform techniques for solving DE's
- evaluate integrals using Beta and Gamma functions
- evaluate the multiple integrals and can apply these concepts to find areas, volumes, moment of inertia etc of regions on a plane or in space
- evaluate the line, surface and volume integrals and converting them from one to another

**UNIT – I**

**Laplace Transforms:** Laplace transforms of standard functions, Shifting theorems, derivatives and integrals, properties- Unit step function, Dirac's delta function, Periodic function, Inverse Laplace transforms, Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

**UNIT - II**

**Beta and Gamma Functions:** Beta and Gamma functions, properties, relation between Beta and Gamma functions, evaluation of integrals using Beta and Gamma functions.

Applications: Evaluation of integrals.

**UNIT – III**

**Multiple Integrals:** Double and triple integrals, Change of variables, Change of order of integration. **Applications:** Finding areas, volumes & Center of gravity (evaluation using Beta and Gamma functions).

**UNIT – IV**

**Vector Differentiation:** Scalar and vector point functions, Gradient, Divergence, Curl and their physical and geometrical interpretation, Laplacian operator, Vector identities.

## **UNIT – V**

**Vector Integration:** Line Integral, Work done, Potential function, area, surface and volume integrals, Vector integral theorems: Greens, Stokes and Gauss divergence theorems (without proof) and related problems.

### **Text Books:**

1. Advanced Engineering Mathematics by R K Jain & S R K Iyengar, Narosa Publishers
2. Engineering Mathematics by Srimanthapal and Subodh C. Bhunia, Oxford Publishers

### **References:**

1. Advanced Engineering Mathematics by Peter V. O. Neil, Cengage Learning Publishers.
2. Advanced Engineering Mathematics by Lawrence Turyn, CRC Press

**MA203BS: Mathematics - III**  
**(Statistical and Numerical Methods)**

**B.Tech. I Year II Sem.**

**L T/P/D C**  
**4 1/0/0 4**

**Prerequisites:** Foundation course (No prerequisites).

**Course Objectives:** To learn

- random variables that describe randomness or an uncertainty in certain realistic situation
- binomial geometric and normal distributions
- sampling distribution of mean, variance, point estimation and interval estimation
- the testing of hypothesis and ANOVA
- the topics those deals with methods to find roots of an equation
- to fit a desired curve by the method of least squares for the given data
- solving ordinary differential equations using numerical techniques

**Course Outcomes:** After learning the contents of this course the student must be able to

- differentiate among random variables involved in the probability models which are useful for all branches of engineering
- calculate mean, proportions and variances of sampling distributions and to make important decisions for few samples which are taken from a large data
- solve the tests of ANOVA for classified data
- find the root of a given equation and solution of a system of equations
- fit a curve for a given data
- find the numerical solutions for a given first order initial value problem

**UNIT – I**

**Random variables and Distributions:**

Introduction, Random variables, Discrete random variable, Continuous random variable, Probability distribution function, Probability density function, Expectation, Moment generating function, Moments and properties. Discrete distributions: Binomial and geometric distributions. Continuous distribution: Normal distributions.

**UNIT – II**

**Sampling Theory:** Introduction, Population and samples, Sampling distribution of means ( $\sigma$  Known)-Central limit theorem, t-distribution, Sampling distribution of means ( $\sigma$  unknown)-Sampling distribution of variances –  $\chi^2$  and F- distributions, Point estimation, Maximum error of estimate, Interval estimation.

**UNIT – III**

**Tests of Hypothesis:** Introduction, Hypothesis, Null and Alternative Hypothesis, Type I and Type II errors, Level of significance, One tail and two-tail tests, Tests concerning one mean and proportion, two means-proportions and their differences-ANOVA for one-way classified data.

## **UNIT – IV**

**Algebraic and Transcendental Equations & Curve Fitting:** Introduction, Bisection Method, Method of False position, Iteration methods: fixed point iteration and Newton Raphson methods. Solving linear system of equations by Gauss-Jacobi and Gauss-Seidal Methods.

**Curve Fitting:** Fitting a linear, second degree, exponential, power curve by method of least squares.

## **UNIT – V**

**Numerical Integration and solution of Ordinary Differential equations:** Trapezoidal rule- Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule- Solution of ordinary differential equations by Taylor's series, Picard's method of successive approximations, Euler's method, Runge-Kutta method (second and fourth order)

### **Text Books:**

1. Probability and Statistics for Engineers by Richard Arnold Johnson, Irwin Miller and John E. Freund, New Delhi, Prentice Hall.
2. Probability and Statistics for Engineers and Sciences by Jay L. Devore, Cengage Learning.
3. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar and R. K. Jain, New Age International Publishers

### **References:**

1. Fundamentals of Mathematical Statistics by S. C. Gupta & V. K. Kapoor, S. Chand.
2. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning Pvt. Ltd.
3. Mathematics for engineers and scientists by Alan Jeffrey, 6<sup>th</sup> edition, CRC press.

## **CS104ES/CS204ES: COMPUTER PROGRAMMING IN C**

**B.Tech. I Year II Sem.**

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

### **Course Objectives:**

- To learn the fundamentals of computers.
- To understand the various steps in Program development.
- To learn the syntax and semantics of C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn to write programs using structured programming approach in C to solve problems.

### **Course Outcomes:**

- Demonstrate the basic knowledge of computer hardware and software.
- Ability to write algorithms for solving problems.
- Ability to draw flowcharts for solving problems.
- Ability to code a given logic in C programming language.
- Gain knowledge in using C language for solving problems.

### **UNIT - I**

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development, algorithms and flowcharts , Number systems-Binary, Decimal, Hexadecimal and Conversions, storing integers and real numbers.

Introduction to C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements(making decisions) – if and switch statements, Repetition statements ( loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Program examples.

### **UNIT - II**

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs.

Arrays – Concepts, using arrays in C, inter function communication, array applications- linear search, binary search and bubble sort, two – dimensional arrays, multidimensional arrays, C program examples.

### **UNIT - III**

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and

arrays, Passing an array to a function, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

#### **UNIT - IV**

Enumerated, Structure and Union Types – The Type Definition (typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures-Nested structures, structures containing arrays, structures containing pointers, arrays of structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples, command–line arguments, Preprocessor commands.

#### **UNIT – V**

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions (fseek ,rewind and ftell), C program examples.

#### **Text Books:**

1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Second Edition, Oxford University Press.

#### **Reference Books:**

1. The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, Second Edition, Pearson education.
2. Programming with C, B. Gottfried, 3<sup>rd</sup> edition, Schaum's outlines, McGraw Hill Education (India) Pvt Ltd.
3. C From Theory to Practice, G S. Tselikis and N D. Tselikas, CRC Press.
4. Basic computation and Programming with C, Subrata Saha and S. Mukherjee, Cambridge University Press.

## ME106ES/ME205ES: ENGINEERING GRAPHICS

**B.Tech. I Year II Sem.**

**L T/P/D C**  
**2 0/0/4 4**

**Pre-requisites:** None

### **Course objectives:**

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

### **Course Outcomes:**

- Ability to prepare working drawings to communicate the ideas and information.
- Ability to read, understand and interpret engineering drawings.

### **UNIT – I**

**Introduction To Engineering Drawing:** Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid Involute. Scales – Plain, Diagonal, and Vernier Scales.

### **UNIT - II**

**Orthographic Projections:** Principles of Orthographic Projections – Conventions – Projections of Points and Lines Projections of Plane regular geometric figures.—Auxiliary Planes.

### **UNIT – III**

Projections of Regular Solids – Auxiliary Views.

### **UNIT – IV**

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, and Cone

### **UNIT – V**

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions Auto CAD: Basic principles only.

### **Text Books:**

1. Engineering Drawing / Basant Agrawal and Mc Agrawal/ Mc Graw Hill
2. Engineering Drawing/ M.B. Shah, B.C. Rane / Pearson.



**Reference Books:**

1. Engineering Drawing / N.S. Parthasarathy and Vela Murali/ Oxford
2. Engineering Drawing N.D. Bhatt / Charotar

## CH206BS: ENGINEERING CHEMISTRY LAB

B.Tech. I Year II Sem.

L T/P/D C  
0 0/3/0 2

### LIST OF EXPERIMENTS

#### Volumetric Analysis:

1. Estimation of Ferrous ion by Dichrometry.
2. Estimation of hardness of water by Complexometric method using EDTA.
3. Estimation of Ferrous and Ferric ions in a given mixture by Dichrometry.
4. Estimation Ferrous ion by Permanganometry.
5. Estimation of copper by Iodomery.
6. Estimation of percentage of purity of  $\text{MnO}_2$  in pyrolusite
7. Determination of percentage of available chlorine in bleaching powder.
8. Determination of salt concentration by ion- exchange resin.

#### Instrumental methods of Analysis:

1. Estimation of HCl by Conductometry.
2. Estimation of Ferrous ion by Potentiometry.
3. Determination of Ferrous iron in cement by Colorimetric method.
4. Determination of viscosity of an oil by Redwood / Oswald's Viscometer.
5. Estimation of manganese in  $\text{KMnO}_4$  by Colorimetric method.
6. Estimation of HCl and Acetic acid in a given mixture by Conductometry.
7. Estimation of HCl by Potentiometry.

#### Preparation of Polymers:

1. Preparation of Bakelite and urea formaldehyde resin.

**Note:** All the above experiments must be performed.

#### Text Books:

1. Vogel's Text Book of Quantitative Chemical Analysis, 5<sup>th</sup> Edition (2015)
2. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney.
3. A Text Book on experiments and calculations in Engineering Chemistry by S.S. Dara S. Chand & Company Ltd., Delhi (2003).

## PH107BS/PH207BS: ENGINEERING PHYSICS LAB

**B.Tech. I Year II Sem.**

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

### LIST OF EXPERIMENTS

1. Dispersive power of the material of a prism – Spectrometer.
2. Determination of wavelengths of white source – Diffraction grating.
3. Newton's Rings – Radius of curvature of Plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Charging, discharging and time constant of an R-C circuit.
6. L-C-R circuit – Resonance & Q-factor.
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method and to verify Biot – Savart's law.
8. Study the characteristics of LED and LASER diode.
9. Bending losses of fibres & Evaluation of numerical aperture of a given fibre.
10. Energy gap of a material of p-n junction.
11. Torsional pendulum – Rigidity modulus.
12. Wavelength of light, resolving power and dispersive power of a diffraction grating using laser.
13. V-I characteristics of a solar cell.

**Note:** Minimum 10 experiments must be performed.

## CS108ES/CS208ES: COMPUTER PROGRAMMING IN C LAB

**B.Tech. I Year II Sem.**

L	T/P/D	C
0	0/3/0	2

### Course Objective:

- To write programs in C using structured programming approach to solve the problems.

### Course Outcomes:

- Ability to design and test programs to solve mathematical and scientific problems.
- Ability to write structured programs using control structures and functions.

### Recommended Systems/Software Requirements:

- Intel based desktop PC
- GNU C Compiler

1. a) Write a C program to find the factorial of a positive integer.  
b) Write a C program to find the roots of a quadratic equation.
2. a) Write a C program to determine if the given number is a prime number or not.  
b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. a) Write a C program to construct a pyramid of numbers.  
b) Write a C program to calculate the following Sum:  
$$\text{Sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$
4. a) The least common multiple (LCM) of two positive integers a and b is the smallest integer that is evenly divisible by both a and b. Write a C program that reads two integers and calls LCM (a, b) function that takes two integer arguments and returns their LCM. The LCM (a, b) function should calculate the least common multiple by calling the GCD (a, b) function and using the following relation:  
$$\text{LCM (a, b)} = ab / \text{GCD (a, b)}$$
  
b) Write a C program that reads two integers n and r to compute the ncr value using the following relation:  
$$n_{c_r} (n, r) = n! / r! (n-r)! .$$
 Use a function for computing the factorial value of an integer.
5. a) Write C program that reads two integers x and n and calls a recursive function to compute  $x^n$   
b) Write a C program that uses a recursive function to solve the Towers of Hanoi problem.  
c) Write a C program that reads two integers and calls a recursive function to compute  $n_{c_r}$  value.

6. a) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user using Sieve of Eratosthenes algorithm.  
b) Write a C program that uses non recursive function to search for a Key value in a given list of integers. Use linear search method.
7. a) Write a menu-driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.  
b) Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers. Use binary search method.
8. a) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.  
b) Write a C program that reads two matrices and uses functions to perform the following:
  1. Addition of two matrices
  2. Multiplication of two matrices
9. a) Write a C program that uses functions to perform the following operations:
  1. to insert a sub-string into a given main string from a given position.
  2. to delete n characters from a given position in a given string.  
b) Write a C program that uses a non recursive function to determine if the given string is a palindrome or not.
10. a) Write a C program to replace a substring with another in a given line of text.  
b) Write a C program that reads 15 names each of up to 30 characters, stores them in an array, and uses an array of pointers to display them in ascending (ie. alphabetical) order.
11. a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.  
b) Write a C program to convert a positive integer to a roman numeral. Ex. 11 is converted to XI.
12. a) Write a C program to display the contents of a file to standard output device.  
b) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
13. a) Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command-line arguments.  
b) Write a C program to compare two files, printing the first line where they differ.
14. a) Write a C program to change the nth character (byte) in a text file. Use fseek function.

- b) Write a C program to reverse the first n characters in a file. The file name and n are specified on the command line. Use fseek function.
15. a) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).
- b) Define a macro that finds the maximum of two numbers. Write a C program that uses the macro and prints the maximum of two numbers.

**Reference Books:**

1. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.
2. Computer Programming in C, V. Rajaraman, PHI.
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. C++: The complete reference, H. Schildt, TMH Publishers.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING****COURSE STRUCTURE & SYLLABUS (2016-17)****II YEAR I SEMESTER**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	MA301BS	Mathematics – IV	4	1	0	4
2	EC302ES	Analog Electronics	4	1	0	4
3	EC303ES	Electrical Technology	4	1	0	4
4	EC304ES	Signals and Stochastic Process	3	1	0	3
5	EC305ES	Network Analysis	3	1	0	3
6	EC306ES	Electronic Devices and Circuits Lab	0	0	3	2
7	EC307ES	Basic Simulation Lab	0	0	3	2
8	EC308ES	Basic Electrical Engineering Lab	0	0	3	2
9	*MC300ES	Environmental Science and Technology	3	0	0	0
		<b>Total Credits</b>	<b>21</b>	<b>5</b>	<b>9</b>	<b>24</b>

**II YEAR II SEMESTER**

<b>S. No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	EC401ES	Switching Theory and Logic Design	3	1	0	3
2	EC402ES	Pulse and Digital Circuits	4	0	0	4
3	EE404ES	Control Systems	4	1	0	4
4	EC405ES	Analog Communications	4	0	0	4
5	SM405MS	Business Economics and Financial Analysis	3	0	0	3
6	EC406ES	Analog Communications Lab	0	0	3	2
7	EC407ES	Pulse and Digital Circuits Lab	0	0	3	2
8	EC408ES	Analog Electronics Lab	0	0	3	2
9	*MC400HS	Gender Sensitization Lab	0	0	3	0
		<b>Total Credits</b>	<b>18</b>	<b>2</b>	<b>12</b>	<b>24</b>

**MA301BS: MATHEMATICS - IV**  
**(Complex Variables and Fourier Analysis)**

**B.Tech. II Year I Sem.**

L	T	P	C
4	1	0	4

**Prerequisites:** Foundation course (No Prerequisites).

**Course Objectives:** To learn

- differentiation and integration of complex valued functions
- evaluation of integrals using Cauchy's integral formula
- Laurent's series expansion of complex functions
- evaluation of integrals using Residue theorem
- express a periodic function by Fourier series and a non-periodic function by Fourier transform
- to analyze the displacements of one dimensional wave and distribution of one dimensional heat equation

**Course Outcomes:** After learning the contents of this paper the student must be able to

- analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem
- find the Taylor's and Laurent's series expansion of complex functions
- the bilinear transformation
- express any periodic function in term of sines and cosines
- express a non-periodic function as integral representation
- analyze one dimensional wave and heat equation

**UNIT – I**

**Functions of a complex variable:** Introduction, Continuity, Differentiability, Analyticity, properties, Cauchy, Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions-Milne-Thompson method

**UNIT - II**

**Complex integration:** Line integral, Cauchy's integral theorem, Cauchy's integral formula, and Generalized Cauchy's integral formula, Power series: Taylor's series- Laurent series, Singular points, isolated singular points, pole of order m – essential singularity, Residue, Cauchy Residue theorem (Without proof).

**UNIT – III**

**Evaluation of Integrals:** Types of real integrals:

(a) Improper real integrals  $\int_{-\infty}^{\infty} f(x)dx$                       (b)  $\int_c^{c+2\pi} f(\cos \theta, \sin \theta)d\theta$

Bilinear transformation- fixed point- cross ratio- properties- invariance of circles.



#### **UNIT – IV**

**Fourier series and Transforms:** Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series.

Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and cosine, transforms, properties, inverse transforms, Finite Fourier transforms.

#### **UNIT – V**

**Applications of PDE:** Classification of second order partial differential equations, method of separation of variables, Solution of one dimensional wave and heat equations.

#### **TEXT BOOKS:**

1. A first course in complex analysis with applications by Dennis G. Zill and Patrick Shanahan, Johns and Bartlett Publishers.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
3. Advanced engineering Mathematics with MATLAB by Dean G. Duffy

#### **REFERENCES:**

1. Fundamentals of Complex Analysis by Saff, E. B. and A. D. Snider, Pearson.
2. Advanced Engineering Mathematics by Louis C. Barrett, McGraw Hill.

## EC302ES: ANALOG ELECTRONICS

B.Tech. II Year I Sem.

L	T	P	C
4	1	0	4

### Course Objectives:

- To introduce circuit realizations with components such as diodes, BJTs and transistors studied earlier.
- To give understanding of various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
- To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.

**Course Outcomes:** Upon completion of the Course, the students will be able to:

- Design and analyze small signal amplifier circuits applying the biasing techniques learnt earlier.
- Cascade different amplifier configurations to obtain the required overall specifications like Gain, Bandwidth, Input and Output interfacing Impedances.
- Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.
- Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.

### UNIT – I

**Analysis And Design of Small Signal Low Frequency BJT Amplifiers:** Review of transistor biasing, Classification of Amplifiers – Distortion in amplifiers, Analysis of CE, CC, and CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors, Design of single stage RC coupled amplifier Different coupling schemes used in amplifiers, Analysis of Cascaded RC Coupled amplifiers, Cascode amplifier, Darlington pair,

### UNIT – II

**Transistor At High Frequency:** The Hybrid-  $\pi$  ( $\pi$ ) – Common Emitter transistor model, CE short circuit current gain, current gain with resistive load, single stage CE transistor amplifier response, Gain-bandwidth product.

### UNIT – III

**FET Amplifiers:** Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOS Amplifiers, – MOSFET – MOSFET Characteristics in Enhancement and Depletion mode – MOS Small signal model, Common source amplifier with resistive, Diode connected and Current source loads, Source follower, Common Gate Stage, Cascode and Folded Cascode Amplifier – frequency response.

### **UNIT –III**

**Positive & Negative Feedback In Amplifiers:** Classification of amplifiers, Concepts of feedback – Classification of feedback amplifiers – General characteristics of negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems. Condition for oscillations. RC and LC type Oscillators – Frequency and amplitude stability of oscillators – Generalized analysis of LC oscillators, Quartz, Hartley, and Colpitts Oscillators – RC-phase shift and Wien-bridge oscillators.

### **UNIT – IV**

**Large Signal Amplifiers:** Class A Power Amplifier, Maximum Value of Efficiency of Class – A Amplifier, Transformer Coupled Amplifier, Push Pull and Complimentary Symmetry Class B and Class AB Power Amplifiers – Principle of operation of class –C Amplifier, Transistor Power Dissipation, Heat Sinks.

**Tuned Amplifiers:** Introduction, Q-Factor, Small Signal Tuned Amplifiers, frequency response of tuned amplifiers

### **TEXT BOOKS:**

1. Electronic Devices and Circuits, David A. Bell – 5<sup>th</sup> Edition, Oxford.
2. Electronic Devices and Circuits, S. Salivahanan, N. Suresh Kumar, A Vallvaraj, 5<sup>th</sup> Edition, MC GRAW HILL EDUCATION.
3. Electronics circuits and applications , Md H Rashid, Cengage 2014

### **REFERENCES:**

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11<sup>th</sup> Edition, 2009, Pearson.
3. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, person

## EC303ES: ELECTRICAL TECHNOLOGY

**B.Tech. II Year I Sem.**

<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 know the basic principle of DC generators and motors.
- To know the basic principle of single phase transformers.
- To understand the basic principle of three-phase induction motor and alternators.
- To understand the basic principle of special motors and electrical instruments.

### **Course Outcome:**

- To analyze the performance of dc generators and motors.
- To analyze the performance of transformers.
- To learn the in-depth knowledge on three phase induction motors.
- To analyze the performance of special motors and electrical instruments in real time applications.

### **UNIT - I**

**D.C Generators and DC Motors:** Principle of operation of DC Machines- EMF equation – Types of generators – Magnetization and load characteristics of DC generators, DC Motors – Types of DC Motors – Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

### **UNIT - II**

**Transformers & Performance:** Principle of operation of single phase transformer – types – Constructional features – Phasor diagram on No Load and Load – Equivalent circuit, Losses and Efficiency of transformer and Regulation – OC and SC tests – Predetermination of efficiency and regulation (Simple Problems).

### **UNIT - III**

**Three Phase Induction Motor:** Principle of operation of three-phase induction motors – Slip ring and Squirrel cage motors – Slip-Torque characteristics – Efficiency calculation – Starting methods.

### **UNIT - IV**

**Alternators:** Alternators – Constructional features – Principle of operation – Types - EMF Equation – Distribution and Coil span factors – Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.

## **UNIT - V**

**Special Motors & Electrical Instruments :** Principle of operation - Shaded pole motors – Capacitor motors, AC servomotor, AC tachometers, Synchros, Stepper Motors – Characteristics, Basic Principles of indicating instruments – Moving Coil and Moving iron Instruments (Ammeters and Voltmeters).

### **TEXT BOOKS:**

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering - T.K. Nagasarkar and M. S. Sukhija, Oxford University Press, 2005

### **REFERENCES:**

1. Principles of Electrical Engineering - V.K Mehta, S. Chand Publications.
2. Theory and Problems of basic electrical engineering - I.J. Nagarath and D.P Kothari, PHI Publications
3. Essentials of Electrical and Computer Engineering - David V. Kerns, JR. J. David Irwin

## EC304ES: SIGNALS AND STOCHASTIC PROCESS

B.Tech. II Year I Sem.

L	T	P	C
3	1	0	3

### Course Objectives:

- This gives the basics of Signals and Systems required for all Electrical Engineering related courses.
- This gives concepts of Signals and Systems and its analysis using different transform techniques.
- This gives basic understanding of random process which is essential for random signals and systems encountered in Communications and Signal Processing areas.

**Course Outcomes:** Upon completing his course, the student will be able to

- Represent any arbitrary analog or Digital time domain signal in frequency domain.
- Understand the importance of sampling, sampling theorem and its effects.
- Understand the characteristics of linear time invariant systems.
- Determine the conditions for distortion less transmission through a system.
- Understand the concepts of Random Process and its Characteristics.
- Understand the response of linear time Invariant system for a Random Processes.

### UNIT - I

**Signal Analysis:** Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

**Signal Transmission through Linear Systems:** Linear System, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and Rise time. Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms

### UNIT – II

**Fourier series, Transforms, and Sampling: Fourier series:** Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

**Fourier Transforms:** Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function.

**Sampling:** Sampling theorem – Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

### **UNIT – III**

**Laplace Transforms and Z-Transforms:** Review of Laplace Transforms (L.T), Partial fraction expansion, Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Constraints on ROC for various classes of signals, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

**Z-Transforms:** Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal, Concept of Z-Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

### **UNIT – IV**

**Random Processes – Temporal Characteristics:** The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

### **UNIT- V:**

**Random Processes – Spectral Characteristics:** The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

### **TEXT BOOKS:**

1. Signals, Systems & Communications - B.P. Lathi , 2013, BSP.
2. Signal and systems principles and applications, shaila dinakar Apten, Cambridge university press, 2016.
3. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, MC GRAW HILL EDUCATION, 4<sup>th</sup> Edition, 2001

### **REFERENCE BOOKS:**

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2 Ed.,
2. Signals and Signals – Iyer and K. Satya Prasad, Cengage Learning

## EC305ES: NETWORK ANALYSIS

**B.Tech. II Year I Sem.**

L	T	P	C
3	1	0	3

**Pre-requisite:** Basic Electrical & Electronics Engineering

**Course Objectives:** Objectives of this course are

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states in RLC circuits.
- To know the basic Laplace transforms techniques in periodic waveforms.
- To understand the two port network parameters.
- To understand the properties of LC networks and filters.

**Course Outcomes:** After completion of this course student:

- Gains the knowledge on Basic network elements.
- Learns and analyze the RLC circuits' behavior in detail.
- Analyze the performance of periodic waveforms.
- Learns and gain the knowledge in characteristics of two port network parameters (Z, Y, ABCD, h & g).
- To analyze the filter design concepts in real world applications.

### UNIT - I

Review of R, L, C, RC, RL, RLC circuits, Network Topology, Terminology, Basic cutset and tie set matrices for planar networks, Illustrative Problems, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

### UNIT - II

Steady state and transient analysis of RC, RL and RLC Circuits, Circuits with switches, step response, 2<sup>nd</sup> order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves

### UNIT - III

Network Analysis using Laplace transform techniques, step, impulse and exponential excitation, response due to periodic excitation, RMS and average value of periodic waveforms.

### UNIT - IV

Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros.



## **UNIT - V**

Standard T,  $\pi$ , L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network, T and  $\pi$  Conversion, LC Networks and Filters: Properties of LC Networks, Foster's Reactance theorem, design of constant K, LP, HP and BP Filters, Composite filter design.

### **TEXT BOOKS**

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3<sup>rd</sup> Edition, 2000.
2. Networks, Lines and Fields - JD Ryder, PHI, 2<sup>nd</sup> Edition, 1999.

### **REFERENCES**

1. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 5<sup>th</sup> Edition, 1993.
2. Electric Circuits – J. Edminister and M.Nahvi – Schaum's Outlines, MCGRAW HILL EDUCATION, 1999.
3. Network Theory – Sudarshan and Shyam Mohan, Mc Graw Hill Education.

## EC306ES: ELECTRONIC DEVICES AND CIRCUITS LAB

**B.Tech. II Year I Sem.**

L	T	P	C
0	0	3	2

### Course Objectives

- To identify various components and testing of active devices.
- To study and operation of millimeters, function generators ,regulated power supplies and CRO To know the characteristics of various active devices.
- To study frequency response amplifier.

### Course Outcomes:

- After Completion of the course the student is able to Apply various devices to real time problems.
- Compute frequency response of various amplifiers.

### Part A: (Only for viva-voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions):

1. Identification, Specification, testing of R,L,C components (color codes), Potentiometers (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Board, PCB's
2. Identification, Specification, testing of Active devices: Diodes, BJT, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.
3. Study and operation of:
  - i. Multimeters (Analog and Digital)
  - ii. Function Generator
  - iii. Regulated Power Supplies
  - iv. CRO

### Part B: (For Laboratory Examination – Minimum of 12 experiments)

1. Forward and Reverse Bias V-I characteristics of PN junction Diode.
2. Zener diode V-I characteristics and Zener diode as voltage regulator.
3. Half Wave rectifier, with and without filters
4. Full wave rectifier with and without filters.
5. Input and output Characteristics of a BJT in CE configuration and calculation of h-parameters.
6. Input and output Characteristics of a BJT in CB configuration and calculation of h-parameters.
7. FET characteristics in CS configuration.
8. Design of self bias circuit
9. Frequency response of CE Amplifier.
10. Frequency response of CC Amplifier.
11. Frequency response of CS FET Amplifier.
12. SCR characteristics.
13. UJT characteristics.

**PART C: Equipment required for Laboratory:**

1. Regulated Power supplies (RPS) : 0-30 V
2. CRO's : 0-20 MHz.
3. Function Generators : 0-1 MHz.
4. Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital) : 0-20  $\mu$ A, 0-50 $\mu$ A, 0-100 $\mu$ A, 0-200 $\mu$ A, 10 mA.
8. Voltmeters (Analog or Digital) : 0-50V, 0-100V, 0-250V
9. Electronic Components: Resistors, Capacitors, BJTs, LCDs, SCRs, UJT, FETs, LEDs, MOSFETs, Diodes-Ge & Si type, Transistors – NPN, PNP type.

## EC307ES: BASIC SIMULATION LAB

**B.Tech. II Year I Sem.**

L	T	P	C
0	0	3	2

**Note:**

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 15 experiments are to be completed

**List of Experiments:**

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution for Signals and sequences.
6. Auto Correlation and Cross Correlation for Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
9. Gibbs Phenomenon Simulation.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Sampling Theorem Verification.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process for Stationarity in Wide sense.

## EC308ES: BASIC ELECTRICAL ENGINEERING LAB

**B.Tech. II Year I Sem.**

<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 6 experiments from each part are to be conducted

### **PART – A**

1. Verification of KVL and KCL.
2. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
3. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
4. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
5. Two port network parameters -ABCD and h parameters
6. Verification of Superposition and Reciprocity theorems.
7. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
8. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

### **PART – B**

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
2. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Brake test on 3-phase Induction motor (performance characteristics).
6. Regulation of alternator by synchronous impedance method.
7. Load test on single phase transform

## MC300ES: ENVIRONMENTAL SCIENCE AND TECHNOLOGY

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	0

### Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

### Course Outcomes:

1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

### UNIT-I

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

### UNIT-II

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

### UNIT-III

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

### UNIT-IV

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics

of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

## **UNIT-V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

## **TEXT BOOKS:**

- 1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

## **REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

## EC401ES: SWITCHING THEORY AND LOGIC DESIGN

**B.Tech. II Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

### **Course Objectives:**

This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
- To implement synchronous state machines using flip-flops.

**Course Outcomes:** Upon completion of the course, students should possess the following skills:

- Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray and BCD.
- Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
- Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
- Be able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

### **UNIT – I**

**Number System and Boolean algebra And Switching Functions:** Review of number systems, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes.

**Boolean Algebra:** Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

### **UNIT - II**

**Minimization and Design of Combinational Circuits:** Introduction, The Minimization of switching function using theorem, The Karnaugh Map Method-Up to Five Variable Maps, Don't Care Map Entries, Tabular Method, Design of Combinational Logic: Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Relations.



### **UNIT - III**

**Sequential Machines Fundamentals and Applications: Introduction:** Basic Architectural Distinctions between Combinational and Sequential circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

**Registers and Counters:** Shift Registers, Data Transmission in Shift Registers, Operation of Shift Registers, Shift Register Configuration, Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation Of Asynchronous And Synchronous Counters.

### **UNIT - IV**

**Sequential Circuits - I:** Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Synthesis of Synchronous Sequential Circuits, Serial Binary Adder, Sequence Detector, Parity-bit Generator, Design of Asynchronous Counters, Design of Synchronous Modulo N – Counters.

### **UNIT - V**

**Sequential Circuits - II:** Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques, and Merger chart methods-concept of minimal cover table.

### **TEXT BOOKS:**

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge.
2. Digital Design- Morris Mano, 5rd Edition, Pearson.

### **REFERENCE BOOKS:**

1. Modern Digital electronics RP Jain 4th Edition, McGraw Hill
2. Switching Theory and Logic Design – A Anand Kumar, 3rd Edition, PHI, 2013.

## EC402ES: PULSE AND DIGITAL CIRCUITS

B.Tech. II Year II Sem.

L	T	P	C
4	0	0	4

### Course Objectives:

- To explain the complete response of R-C and R-L-C transient circuits.
- To explain clippers, clampers, switching characteristics of transistors and sampling gates.
- To construct various multivibrators using transistors, design of sweep circuits and sampling gates.
- To discuss and realize logic gates using diodes and transistors.

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

- Understand the applications of diode as integrator, differentiator, clippers, clamper circuits.
- Learn various switching devices such as diode, transistor, SCR. Difference between logic gates and sampling gates
- Design multivibrators for various applications, synchronization techniques and sweep circuits.
- Realizing logic gates using diodes and transistors.
- Understanding of time and frequency domain aspects.
- Importance of clock pulse and its generating techniques.

### UNIT - I

**Linear Wave Shaping:** High pass and low pass RC circuits and their response for Sinusoidal, Step, Pulse, Square, & Ramp inputs, High pass RC network as Differentiator, Low pass RC circuit as an Integrator, Attenuators and its application as a CRO Probe, RL and RLC Circuits and their response for Step Input, Ringing Circuit.

### UNIT - II

**Non-Linear Wave Shaping:** Diode clippers, Transistor clippers, Clipping at two independent levels, Comparators, Applications of Voltage comparators. Clamping Operation, Clamping circuit taking Source and Diode resistances into account, Clamping Circuit Theorem, Practical Clamping Circuits, Effect of Diode Characteristics on Clamping Voltage, Synchronized Clamping.

### UNIT - III

**Switching Characteristics of Devices:** Diode as a Switch, Piecewise Linear Diode Characteristics, Diode Switching times, Transistor as a Switch, Break down voltages, Transistor in Saturation, Temperature variation of Saturation Parameters, Transistor-switching times, Silicon-controlled-switch circuits.

## **UNIT – IV**

**Multivibrators:** Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

**Time Base Generators:** General features of a Time base Signal, Methods of Generating Time Base Waveform, Transistor Miller Time Base generator, Transistor Bootstrap Time Base Generator, Transistor Current Time Base Generators, Methods of Linearity improvement.

## **UNIT - V**

**Sampling Gates:** Basic operating principles of Sampling Gates, Unidirectional and Bi-directional Sampling Gates, Four Diode Sampling Gate, Reduction of pedestal in Gate Circuits

**Realization of Logic Gates Using Diodes & Transistors:** AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL and CML Logic Families and its Comparison.

### **TEXT BOOKS:**

1. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 Ed., 2008, McGraw Hill.
2. Pulse, Switching and Digital Circuits - David A. Bell, 5th edition 2015, OXFORD University Press

### **REFERENCE BOOKS:**

1. Pulse and Digital Circuits -Venkata Rao K, Rama Sudha K, Manmadha rao G, Pearson, 2010
2. Pulse and Digital Circuits – A. Anand Kumar, 2005, PHI.

## SM405ES: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

**B.Tech. II Year II Sem.**

L	T	P	C
3	0	0	3

**Course Objective:** To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

**Course Outcome:** The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

### UNIT – I

#### **Introduction to Business and Economics:**

**Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

### UNIT – II

#### **Demand and Supply Analysis:**

**Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

**Supply Analysis:** Determinants of Supply, Supply Function & Law of Supply.

### UNIT- III

#### **Production, Cost, Market Structures & Pricing:**

**Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

**Cost analysis:** Types of Costs, Short run and Long run Cost Functions.

**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition.

**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

#### **UNIT - IV**

**Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

#### **UNIT - V**

**Financial Analysis through Ratios:** Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

#### **TEXT BOOKS:**

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

#### **REFERENCES:**

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

## EE404ES: CONTROL SYSTEMS

B.Tech. II Year II Sem.

L	T	P	C
4	1	0	4

**Prerequisite:** Ordinary Differential Equations & Laplace Transform, Mathematics I

### Course objectives:

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

**Course outcomes:** After completion of this course the student is able to

- Improve the system performance by selecting a suitable controller and/or a compensator for a specific application
- Apply various time domain and frequency domain techniques to assess the system performance
- Apply various control strategies to different applications (example: Power systems, electrical drives etc...)
- Test system Controllability and Observability using state space representation and applications of state space representation to various systems.

### UNIT – I

**Introduction:** Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations - Impulse Response and transfer functions - Translational and Rotational mechanical systems.

**Transfer Function Representation:** Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

### UNIT-II

**Time Response Analysis:** Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

### **UNIT – III**

**Stability Analysis:** The concept of stability - Routh stability criterion – qualitative stability and conditional stability.

**Root Locus Technique:** The root locus concept - construction of root loci-effects of adding poles and zeros to  $G(s)H(s)$  on the root loci.

**Frequency Response Analysis:** Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

### **UNIT - IV**

**Stability Analysis In Frequency Domain:** Polar Plots, Nyquist Plots and applications of Nyquist criterion to find the stability - Effects of adding poles and zeros to  $G(s)H(s)$  on the shape of the Nyquist diagrams.

**Classical Control Design Techniques:** Compensation techniques – Lag, Lead, and Lead-Lag Controllers design in frequency Domain, PID Controllers.

### **UNIT – V**

**State Space Analysis of Continuous Systems:** Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties.

### **TEXT BOOKS:**

1. “I. J. Nagrath and M. Gopal”, “Control Systems Engineering”, New Age International (P) Limited, Publishers, 5<sup>th</sup> edition, 2009
2. “B. C. Kuo”, “Automatic Control Systems”, John wiley and sons, 8th edition, 2003.

### **REFERENCE BOOKS:**

1. “N. K. Sinha”, “Control Systems”, New Age International (P) Limited Publishers, 3<sup>rd</sup> Edition, 1998.
2. “NISE”, “Control Systems Engineering”, John wiley, 6<sup>th</sup> Edition, 2011.
3. “Katsuhiko Ogata”, “Modern Control Engineering”, Prentice Hall of India Pvt. Ltd., 3<sup>rd</sup> edition, 1998.

## EC405ES: ANALOG COMMUNICATIONS

B.Tech. II Year II Sem.

<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:

- To develop ability to analyze system requirements of analog communication systems.
- To understand the need for modulation
- To understand the generation, detection of various analog modulation techniques and also perform the mathematical analysis associated with these techniques.
- To acquire knowledge to analyze the noise performance of analog modulation techniques.
- To acquire theoretical knowledge of each block in AM and FM receivers.
- To understand the pulse modulation techniques.

### Course Outcomes:

- Able to analyze and design various modulation and demodulation analog systems.
- Understand the characteristics of noise present in analog systems.
- Study of signal to Noise Ratio (SNR) performance, of various Analog Communication systems.
- Analyze and design the various Pulse Modulation Systems.
- Understand the concepts of Multiplexing: Time Division Multiplexing (TDM) and Frequency Division Multiplexing (FDM).

### UNIT - I

**Amplitude Modulation:** Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector, Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop.

### UNIT - II

**SSB Modulation:** Introduction to Hilbert Transform, Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.



### **UNIT - III**

**Angle Modulation:** Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM and AM.

### **UNIT - IV**

**Noise:** Resistive Noise Source (Thermal), Arbitrary Noise Sources, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise, & its properties

Noise in Analog communication System, Noise in DSB and SSB System Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis and de-emphasis.

### **UNIT - V**

**Receivers:** Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

**PULSE MODULATION:** Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation and demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing.

### **TEXTBOOKS:**

1. Communication Systems by Simon Haykins John Wiley & Sons, 4<sup>th</sup> Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, McGraw Hill Education 2004.

### **REFERENCES:**

1. Communication theory, thomas, 2 edition, McGraw-Hill Education
2. Communication Systems, 2E, R. P. Singh, S. D. Sapre, McGraw-Hill Education, 2008.
3. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005
4. Electronics Communication Systems- Wayne Tomasi, 6th Edition, Person 2009

## **EC406ES: ANALOG COMMUNICATIONS LAB**

**B.Tech. II Year II Sem.**

<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 12 experiments should be conducted:
- Experiments are to be simulated first either using MATLAB, Comsim or any other simulation software tools and then testing to be done in hardware.

**LIST OF EXPERIMENTS:**

1. Amplitude modulation and demodulation.
2. DSB-SC Modulator & Detector
3. SSB-SC Modulator & Detector (Phase Shift Method)
4. Frequency modulation and demodulation.
5. Study of spectrum analyzer and analysis of AM and FM Signals
6. Pre-emphasis & de-emphasis.
7. Time Division Multiplexing & De multiplexing
8. Frequency Division Multiplexing & De multiplexing
9. Verification of Sampling Theorem
10. Pulse Amplitude Modulation & Demodulation
11. Pulse Width Modulation & Demodulation
12. Pulse Position Modulation & Demodulation
13. Frequency Synthesizer.
14. AGC Characteristics.
15. PLL as FM Demodulator

## EC407ES: PULSE AND DIGITAL CIRCUITS LAB

**B.Tech. II Year II Sem.**

L	T	P	C
0	0	3	2

**Note:**

**Minimum Twelve experiments to be conducted:**

1. Linear wave Shaping
  - a. RC Low Pass Circuit for different time constants
  - b. RC High Pass Circuit for different time constants
2. Non-linear wave shaping
  - a. Transfer characteristics and response of Clippers:
    - i) Positive and Negative Clippers
    - ii) Clipping at two independent levels
  - b. The steady state output waveform of clampers for a square wave input
    - i) Positive and Negative Clampers
    - ii) Clamping at different reference voltage
3. Comparison Operation of different types of Comparators
4. Switching characteristics of a transistor
5. Design a Bistable Multivibrator and draw its waveforms
6. Design an Astable Multivibrator and draw its waveforms
7. Design a Monostable Multivibrator and draw its waveforms
8. Response of Schmitt Trigger circuit for loop gain less than and greater than one
9. UJT relaxation oscillator
10. The output- voltage waveform of Boot strap sweep circuit
11. The output- voltage waveform of Miller sweep circuit
12. Pulse Synchronization of An Astable circuit
13. Response of a transistor Current sweep circuit
14. Sampling gates
  - a. Response of Unidirectional gate
  - b. Response of Bidirectional gate using transistors
15. Study of logic gates

## **EC408ES: ANALOG ELECTRONICS LAB**

**B.Tech. II Year II Sem.**

<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 12 experiments should be conducted:
- Experiments are to be simulated using Multisim or P-spice or Equivalent Simulation and then testing to be done in hardware.

**LIST OF EXPERIMENTS:**

1. Common Emitter Amplifier
2. Common Base Amplifier
3. Common Source amplifier
4. Two Stage RC Coupled Amplifier
5. Current Shunt Feedback Amplifier
6. Voltage Series Feedback Amplifier
7. Cascode Amplifier
8. Wien Bridge Oscillator using Transistors
9. RC Phase Shift Oscillator using Transistors
10. Class A Power Amplifier (Transformer less)
11. Class B Complementary Symmetry Amplifier
12. Hartley Oscillator
13. Colpitt's Oscillator
14. Single Tuned Voltage Amplifier

## MC400HS: GENDER SENSITIZATION LAB

**B.Tech. II Year II Sem.**

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

### **Course Objectives:**

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

### **Course Outcomes:**

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

### **UNIT - I**

#### **UNDERSTANDING GENDER**

**Gender:** Why Should We Study It? (*Towards a World of Equals*: Unit -1)

**Socialization:** Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

### **UNIT - II**

#### **GENDER AND BIOLOGY:**

**Missing Women:** Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)

Declining Sex Ratio. Demographic Consequences.

**Gender Spectrum:** Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many? Struggles with Discrimination.

### UNIT - III

#### GENDER AND LABOUR

**Housework:** the Invisible Labour (*Towards a World of Equals*: Unit -3)

“My Mother doesn’t Work.” “Share the Load.”

**Women’s Work:** Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

### UNIT-IV

#### ISSUES OF VIOLENCE

**Sexual Harassment:** Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: “Chupulu”.

**Domestic Violence:** Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-“I Fought for my Life....” - Additional Reading: The Caste Face of Violence.

### UNIT - V

#### GENDER: CO - EXISTENCE

**Just Relationships:** Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

### TEXTBOOK

All the five Units in the Textbook, “*Towards a World of Equals: A Bilingual Textbook on Gender*” written by A. Suneetha, Uma Bhugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**, Telangana State in the year **2015**.

**Note:** Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

### REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. “*I Fought For My Life...and Won.*” Available online at:  
<http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulali/>

**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**

<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
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**

<b>S. No</b>	<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
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>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

### 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, Aisan 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 Schilling, 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>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### 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**

<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:** 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.

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

S.No.	Course Code	Course Title	L	T	P	Credits
1	EC701PC	Microwave Engineering	4	0	0	4
2		Professional Elective - II	3	0	0	3
3		Professional Elective - III	3	0	0	3
4		Professional Elective - IV	3	0	0	3
5	EC702PC	VLSI Design	4	0	0	4
6	EC703PC	VLSI and E-CAD Lab	0	0	3	2
7	EC704PC	Microwave Engineering Lab	0	0	3	2
8	EC705PC	Industry Oriented Mini Project	0	0	3	2
9	EC706PC	Seminar	0	0	2	1
		<b>Total Credits</b>	<b>17</b>	<b>0</b>	<b>11</b>	<b>24</b>

**IV YEAR II SEMESTER**

S.No.	Course Code	Course Title	L	T	P	Credits
1		Open Elective – III	3	0	0	3
2		Professional Elective -V	3	0	0	3
3		Professional Elective -VI	3	0	0	3
4	EC801PC	Major Project	0	0	30	15
		<b>Total Credits</b>	<b>9</b>	<b>0</b>	<b>30</b>	<b>24</b>

**Professional Elective – I**

EC611PE	Computer Organization and Operating System
EC612PE	Digital Image Processing
EC613PE	Spread Spectrum Communications
EC614PE	Digital system Design

**Professional Elective – II**

EC721PE	Computer Networks
EC722PE	FPGA Programming
EC723PE	Coding Theory and Techniques
EC724PE	Soft Computing Techniques

**Professional Elective – III**

EC731PE	Wireless Communications and Networks
EC732PE	Internet of Things
EC733PE	Radar Systems
EC734PE	Embedded Sytem Design

**Professional Elective – IV**

EC741PE	Optimization Techniques
EC742PE	Object Oriented Programming
EC743PE	Electronic Measurements and Instrumentation
EC744PE	Artificial Intelligence

**Professional Elective – V**

EC851PE	Network Security and Cryptography
EC852PE	System Design Using FPGAs
EC853PE	Optical Communications
EC854PE	Machine Learning

**Professional Elective – VI**

EC861PE	Actuators and Robot Systems
EC862PE	Analog CMOS IC Design
EC863PE	Global Positioning System
EC864PE	Computer Vision

**\*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.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**LIST OF OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS FOR**  
**B.TECH. III AND IV YEARS**

<b>S. No.</b>	<b>Name of the Department Offering Open Electives</b>	<b>Open Elective – I (Semester – V)</b>	<b>Open Elective – II (Semester – VI)</b>
1	Aeronautical Engg.	AE511OE: Introduction to Space Technology	AE621OE: Introduction to Aerospace Engineering
2	Automobile Engg.	CE511OE: Disaster Management MT512OE: Intellectual Property Rights	MT621OE: Data Structures MT622OE: Artificial Neural Networks
3	Biomedical Engg.	BM511OE: Reliability Engineering	BM621OE: Medical Electronics
4	Civil Engg.	CE511OE: Disaster Management.	CE621OE: Remote Sensing and GIS CE622OE: Geo-Informatics CE623OE: Intellectual Property Rights
5	Civil and Environmental Engg.	CE511OE: Disaster Management	CN621OE: Environmental Impact Assessment CE623OE: Intellectual Property Rights
6	Computer Science and Engg. / Information Technology	CS511OE: Operating Systems CS512OE: Database Management Systems	CS621OE: Java Programming CS622OE: Software Testing Methodologies CS623OE: Cyber Security
7	Electronics and Communication Engg. / Electronics and Telematics Engg.	EC511OE: Principles of Electronic Communications	EC621OE: Principles of Computer Communications and Networks
8	Electronics and Computer Engg.	EM511OE: Scripting Languages	EM621OE: Soft Computing Techniques
9	Electrical and Electronics Engg.	EE511OE: Non-Conventional Power Generation EE512OE: Electrical Engineering Materials EE513OE: Nanotechnology	EE621OE: Design Estimation and Costing of Electrical Systems EE622OE: Energy Storage Systems EE623OE: Introduction to Mechatronics
10	Electronics and Instrumentation Engg.	EI511OE: Electronic Measurements and Instrumentation	EI621OE: Industrial Electronics
11	Mechanical Engg.	ME511OE: Optimization Techniques ME512OE: Computer Graphics ME513OE: Introduction	ME621OE: World Class Manufacturing ME622OE: Fundamentals of Robotics ME623OE: Fabrication

		to Mechatronics ME514OE: Fundamentals of Mechanical Engineering	Processes
12	Mechanical Engg. (Material Science and Nanotechnology)	NT511OE: Fabrication Processes NT512OE: Non destructive Testing Methods NT513OE: Fundamentals of Engineering Materials	NT621OE: Introduction to Material Handling NT622OE: Non-Conventional Energy Sources NT623OE: Robotics
13	Mechanical Engg. (mechatronics)	MT511OE: Analog and Digital I.C. Applications MT512OE: Intellectual Property Rights MT513OE: Computer Organization	MT621OE: Data Structures MT622OE: Artificial Neural Networks MT623OE: Industrial Management
14	Metallurgical and Materials Engg.	MM511OE: Materials Characterization Techniques	MM621OE: Science and Technology of Nano Materials MM622OE: Metallurgy of Non Metallurgists
15	Mining Engg.	MN511OE: Introduction to Mining Technology	MN621OE: Coal Gasification, Coal Bed Methane and Shale Gas
16	Petroleum Engg.	PE511OE: Materials Science and Engineering PE512OE: Renewable Energy Sources PE513OE: Environmental Engineering	PE621OE: Energy Management and Conservation PE622OE: Optimization Techniques PE623OE: Entrepreneurship and Small Business Enterprises

S. No.	Name of the Department Offering Open Electives	Open Elective –III (Semester – VIII)
1	Aeronautical Engg.	AE831OE: Air Transportation Systems AE832OE: Rockets and Missiles
2	Automobile Engg.	AM831OE: Introduction to Mechatronics AM832OE: Microprocessors and Microcontrollers
3	Biomedical Engg.	BM831OE: Telemetry and Telecontrol BM832OE: Electromagnetic Interference and Compatibility
4	Civil Engg.	CE831OE: Environmental Impact Assessment CE832OE: Optimization Techniques in Engineering CE833OE: Entrepreneurship and Small Business Enterprises
5	Civil and Environmental Engg.	CN831OE: Remote Sensing and GIS CE833OE: Entrepreneurship and Small Business

		Enterprises
6	Computer Science and Engg. / Information Technology	CS831OE: Linux Programming CS832OE: R Programming CS833OE: PHP Programming
7	Electronics and Communication Engg. / Electronics and Telematics Engg.	EC831OE: Electronic Measuring Instruments
8	Electronics and Computer Engg.	EM831OE: Data Analytics
9	Electrical and Electronics Engg.	EE831OE: Entrepreneur Resource Planning EE832OE: Management Information Systems EE833OE: Organizational Behaviour
10	Electronics and Instrumentation Engg.	EI831OE: Sensors and Transducers, EI832OE: PC Based Instrumentation
11	Mechanical Engg.	ME831OE: Total Quality Management ME832OE: Industrial Safety, Health, and Environmental Engineering ME833OE: Basics of Thermodynamics ME834OE: Reliability Engineering
12	Mechanical Engg. (Material Science and Nanotechnology)	NT831OE: Concepts of Nano Science And Technology NT832OE: Synthesis of Nanomaterials NT833OE: Characterization of Nanomaterials
13	Mechanical Engg. (mechatronics)	MT831OE: Renewable Energy Sources MT832OE: Production Planning and Control CE833OE: Entrepreneurship and Small Business Enterprises
14	Metallurgical and Materials Engg.	MM831OE: Design and Selection of Engineering Materials
15	Mining Engg.	MN831OE: Solid Fuel Technology MN832OE: Health & Safety in Mines
16	Petroleum Engg.	PE831OE: Disaster Management PE832OE: Fundamentals of Liquefied Natural Gas PE833OE: Health, Safety and Environment in Petroleum Industry

**\*Open Elective** – Students should take Open Electives from 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.

## MICROWAVE ENGINEERING

**B.Tech. IV Year I Sem.**

**Course Code: EC701PC/ET743PE**

<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:** This is a core course in Microwave Communications domain, and covers contents related to Microwave Theory and Techniques. The main objectives of the course are:

- To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
- To develop the theory related to microwave transmission lines, and to determine the characteristics of rectangular waveguides, microstrip lines, and different types of waveguide components and ferrite devices.
- To distinguish between different types of microwave tubes, their structures and principles of microwave power generation, and to characterize their performance features and applications - at tube levels as well as with solid state devices.
- To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S-Matrix for various types of microwave junctions.
- To understand the concepts of microwave measurements, identify the equipment required and precautions to be taken, and get familiarized with the methods of measurement of microwave power and various other microwave parameters.

**Course Outcomes:** Having gone through this course covering different aspects of microwave theory and techniques, the students would be able to

- To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical microwave transmission line problems.
- To distinguish between the different types of waveguide and ferrite components, explain their functioning and select proper components for engineering applications.
- To distinguish between the methods of power generation at microwave frequencies, derive the performance characteristics of 2-Cavity and Reflex Klystrons, Magnetrons, TWTs and estimate their efficiency levels, and solve related numerical problems
- To realize the need for solid state microwave sources, understand the concepts of TEDs, RWH Theory and explain the salient features of Gunn Diodes and ATT Devices.
- To establish the properties of Scattering Matrix, formulate the S-Matrix for various microwave junctions, and understand the utility of S-parameters in microwave component design.
- To set up a microwave bench, establish the measurement procedure and conduct the experiments in microwave lab for measurement of various microwave parameters.

### UNIT - I

**Microwave Transmission Lines - I:** Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – Solution of Wave Equations in



Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Power Transmission, Impossibility of TEM Mode. Illustrative Problems, Micro strip Lines– Introduction,  $Z_0$  Relations, Effective Dielectric Constant.

## UNIT - II

**Cavity Resonators**– Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

**Waveguide Components and Applications:** Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee. Directional Couplers – 2 Hole, Bethe Hole types, Illustrative Problems

Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator, Circulator.

## UNIT - III

**Microwave Tubes:** Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics, Illustrative Problems.

**Helix TWTs:** Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

## UNIT - IV

### M-Type Tubes:

Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics, Illustrative Problems

**Microwave Solid State Devices:** Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Introduction to Avalanche Transit Time Devices.

## UNIT - V

Scattering Matrix– Significance, Formulation and Properties, S Matrix Calculations for – 2 port Junctions, E plane and H plane Tees, Magic Tee, Circulator and Isolator, Illustrative Problems.

**Microwave Measurements:** Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometers. Measurement of Attenuation, Frequency. Standing Wave Measurements – Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

**TEXT BOOKS:**

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

**REFERENCES:**

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering - G.S. Raghuvanshi, Cengage Learning India Pvt. Ltd., 2012.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Microwave Engineering - David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 1989, 3r ed., 2011 Reprint.

## COMPUTER NETWORKS (PROFESSIONAL ELECTIVE – II)

**B.Tech. IV Year I Sem.**

**Course Code: ET702PC/EC721PE**

<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 introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce UDP and TCP Models.
- To have the concept of different routing techniques for data communications.

### Course Outcomes:

- Students should understand and explore the basics of Computer Networks and Various Protocols. He/ She will be in a position to understand the World Wide Web concepts.
- Students will be in a position to administrate a network and flow of information further he/she can understand easily the concepts of network security, Mobile and ad hoc networks.

### UNIT - I

**Introduction to Networks:** Internet, Protocols and Standards, the OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.

**Physical Layer:** Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

### UNIT - II

**Data Link Layer:** Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

### UNIT - III

**Network Layer:** Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman& Ford, Disjkstra's routing protocols, RIP, OSPF, BGP,- and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

### UNIT - IV

**Transport Layer:** Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.

**Application Layer:** Domain Name Space, DNS in Internet, Electronic Mail, File Transfer Protocol, WWW, HTTP, SNMP, Multi-Media.

#### **UNIT - V**

**Network Security:** Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall. Bluetooth, Zigbee, IPv4, IPv6.

#### **TEXT BOOKS:**

1. Data Communications and Networking – Behrouz A. Forouzan, 4<sup>th</sup> Edition Mc Graw Hill Education, 2006.
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3<sup>rd</sup> Edition, Pearson Education.

#### **REFERENCES:**

1. Data communications and Networks by William Stallings, Pearson Edu. 10<sup>th</sup> Edition.
2. Data communication and Networks - Bhusan Trivedi, Oxford University Press 2016.
3. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
4. Understanding Communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning.

## FPGA PROGRAMMING (PROFESSIONAL ELECTIVE – II)

**B.Tech. IV Year I Sem.**  
**Course Code: EC722PE**

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

**Prerequisite:** Switching Theory & Logic Design

### UNIT - I

#### **Simple Programmable Logic Devices (SPLDs):**

Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs), the Masked Gate Array ASIC.

#### **Complex Programmable Logic Devices (CPLDs):**

CPLD Architectures, Function Blocks, I/O Blocks, Clock Drivers, Interconnect CPLD Technology and Programmable Elements, Embedded Devices.

#### **Field Programmable Gate Arrays (FPGAs):**

FPGA Architectures, Configurable Logic Blocks, Configurable I/o Blocks, Embedded Devices, Programmable Inter Connect, Clock Circuitry, SRAM vs. Anti-fuse programming, FPGA Selection Criteria.

### UNIT - II

#### **Universal Design Methodology for Programmable Devices:**

Introduction to UDM and UDM-PD, writing a Specification, Specification Review, Choosing Device and Tools, Design, Verification, Final Review, System Integration and Test. Hardware Descriptive Languages, Structure of VHDL & Verilog module, operator, Data types, Top-Down Design, Synchronous Design, Floating Nodes, Bus Contention, One-Hot state Encoding.

### UNIT - III

#### **Data flow Description and Behavioral Descriptions:**

Introduction to styles types of hardware description –Behavioral, Structural, Dataflow and Mixed type and language descriptions.

**Data flow Description:** Structure of the dataflow description, Signal Declaration and Assignment Statements, Concurrent Signal assignments, Constant declaration and assignments, assigning a delay time to the signal, Data type-Vectors.

**Behavioral Descriptions:** Structure of the HDL Behavioral description, The VHDL/ Verilog HDL variable – assignment statement, sequential statement – IF, signal and variable assignment, CASE & LOOP statements

### UNIT - IV

#### **Structural and Switch level Descriptions.**

**Structural Description:** Organization of the structural description, binding, state machines, Generate (HDL), Generic (VHDL), and parameter (Verilog).

**Switch level Description:** Useful definitions, Single NMOS & PMOS switches-verilog & VHDL description of NMOS & PMOS Switches, serial and parallel combinations of switches, Switch level Description of –primitive gates, Simple combinational logics, simple sequential circuits, Bidirectional Switches.

## **UNIT - V**

### **Procedures, Tasks, Functions and Verification:**

**Mixed type descriptions, Procedures and Tasks:** Procedures (VHDL), Tasks (Verilog), Examples of Procedures and Tasks, Functions in VHDL & Verilog HDL.

**Verification:** Introduction to verification, simulation, static timing Analysis, Association languages and formal verification.

### **TEXT BOOKS:**

1. Designing with FPGAS & CPLDS- Bob Zeidman, CMP Books, First Printed in India 2011
2. HDL Programming Fundamental-VHDL & Verilog, Botros, Cengage Learning, Third Indian Reprint 2012

## CODING THEORY AND TECHNIQUES (PROFESSIONAL ELECTIVE – II)

**B.Tech. IV Year I Sem.**

**Course Code: EC723PE/ET732PE**

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

**Pre-requisite:** Digital Communications

**Course Objectives:**

- To acquire the knowledge in measurement of information and errors.
- Understand the importance of various codes for communication systems.
- To design encoder and decoder of various codes.
- To know the applicability of source and channel codes.

**Course Outcomes:** Upon completing this course, the student will be able to

- Learn measurement of information and errors.
- Obtain knowledge in designing various source codes and channel codes.
- Design encoders and decoders for block and cyclic codes.
- Understand the significance of codes in various applications.

### UNIT - I

**Coding for Reliable Digital Transmission and storage:**

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

**Source Codes:** Shannon-fano coding, Huffman coding

### UNIT - II

**Linear Block Codes:**

Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

### UNIT - III

**Cyclic Codes:**

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

### UNIT - IV

**Convolution Codes:**

Encoding of Convolution Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of

Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolution codes in ARQ system.

## **UNIT - V**

### **BCH Codes:**

Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction.

### **TEXT BOOKS:**

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J. Costello, Jr, Prentice Hall, Inc 2014.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw – Hill Publishing, 1989.

### **REFERENCES:**

1. Digital Communications- John G. Proakis, 5<sup>th</sup> Ed., TMH, 2008.
2. Introduction to Error Control Codes-Salvatore Gravano, oxford
3. Error Correction Coding – Mathematical Methods and Algorithms - Todd K. Moon, Wiley India, 2006.
4. Information Theory, Coding and Cryptography – Ranjan Bose, 2<sup>nd</sup> Ed., TMH, 2009.



## SOFT COMPUTING TECHNIQUES (PROFESSIONAL ELECTIVE – II)

**B.Tech. IV Year I Sem.**  
**Course Code: EC724PE**

<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:** This course makes the students to Understand

- Fundamentals of Neural Networks & Feed Forward Networks.
- Associative Memories & ART Neural Networks.
- Fuzzy Logic & Systems.
- Genetic Algorithms and Hybrid Systems.

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

- Identify and employ suitable soft computing techniques in classification and optimization problems.
- Design hybrid systems to suit a given real – life problem.

### UNIT – I

#### **Fundamentals of Neural Networks & Feed Forward Networks:**

Basic Concept of Neural Networks, Human Brain, Models of an Artificial Neuron, Learning Methods, Neural Networks Architectures, Single Layer Feed Forward Neural Network: The Perceptron Model, Multilayer Feed Forward Neural Network: Architecture of a Back-Propagation Network (BPN), The Solution, Backpropagation Learning, Selection of various Parameters in BPN. Application of Back propagation Networks in Pattern Recognition & Image Processing.

### UNIT – II

#### **Associative Memories & ART Neural Networks:**

Basic concepts of Linear Associative, Basic concepts of Dynamical systems, Mathematical Foundation of Discrete-Time Hop field Networks (HPF), Mathematical Foundation of Gradient-Type Hopfield Networks, Transient response of Continuous Time Networks, Applications of HPF in Solution of Optimization Problem: Minimization of the Traveling salesman tour length, Summing networks with digital outputs, Solving Simultaneous Linear Equations, Bidirectional Associative Memory Networks; Cluster Structure, Vector Quantization, Classical ART Networks, Simplified ART Architecture.

### UNIT – III

#### **Fuzzy Logic & Systems:**

Fuzzy sets, Crisp Relations, Fuzzy Relations, Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule based system, Defuzzification Methods, Applications: Greg Viot's Fuzzy Cruise Controller, Air Conditioner Controller.

## **UNIT – IV**

### **Genetic Algorithms:**

Basic Concepts of Genetic Algorithms (GA), Biological background, Creation of Offsprings, Working Principle, Encoding, Fitness Function, Reproduction, Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operator, Bit-wise Operators used in GA, Generational Cycle, Convergence of Genetic Algorithm.

## **UNIT – V**

### **Hybrid Systems:**

Types of Hybrid Systems, Neural Networks, Fuzzy Logic, and Genetic Algorithms Hybrid, Genetic Algorithm based BPN: GA Based weight Determination, Fuzzy Back Propagation Networks: LR-type fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BPN, Inference by fuzzy BPN.

### **TEXT BOOKS:**

1. Introduction to Artificial Neural Systems - J.M. Zurada, Jaico Publishers
2. Neural Networks, Fuzzy Logic & Genetic Algorithms: Synthesis & Applications -S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI, 2011.
3. Genetic Algorithms by David E. Gold Berg, Pearson Education India, 2006.
4. Neural Networks & Fuzzy Sytems- Kosko.B., PHI, Delhi, 1994.

### **REFERENCES:**

1. Artificial Neural Networks - Dr. B. Yagananarayana, , PHI, 1999.
2. An introduction to Genetic Algorithms - Mitchell Melanie, MIT Press, 1998
3. Fuzzy Sets, Uncertainty and Information- Klir G.J. & Folger. T. A., PHI, Delhi, 1993.

## WIRELESS COMMUNICATIONS AND NETWORKS (PROFESSIONAL ELECTIVE – III)

**B.Tech. IV Year I Sem.**  
**Course Code: EC731PE**

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

**Prerequisite:** Digital Communications

### Course Objectives:

- To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
- To equip the students with various kinds of wireless networks and its operations.
- To provide an analytical perspective on the design and analysis of the traditional and emerging wireless networks, and to discuss the nature of, and solution methods to, the fundamental problems in wireless networking.
- To train students to understand the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.

**Course Outcomes:** Upon completion of the course, the student will be able to:

- Understand cellular system design concepts.
- Analyze various multiple access schemes used in wireless communication.
- Demonstrate wireless Local and Wide area networks and their specifications.
- Familiar with some of the existing and emerging wireless standards.
- Understand the concept of orthogonal frequency division multiplexing.

### UNIT - I

#### The Cellular Concept-System Design Fundamentals:

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

### UNIT – II

#### Mobile Radio Propagation: Large-Scale Path Loss:

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Rice Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor),

Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

### **UNIT – III**

#### **Mobile Radio Propagation: Small –Scale Fading and Multipath:**

Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

### **UNIT - IV**

#### **Equalization and Diversity:**

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

### **UNIT - V**

#### **Wireless Networks:**

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a, b, g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

### **TEXT BOOKS:**

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2<sup>nd</sup> Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE

4. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

**REFERENCES:**

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communication and Networking – William Stallings, 2003, PHI.

## INTERNET OF THINGS (PROFESSIONAL ELECTIVE – III)

**B.Tech. IV Year I Sem.****Course Code: CS724PE/EC732PE**

<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 introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices.

**UNIT - I**

Introduction to Internet of Things -Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

**UNIT - II**

IoT and M2M - Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG -NETCONF, YANG, SNMP NETOPEER

**UNIT - III**

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling. Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib.

**UNIT - IV**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

**UNIT - V**

IoT Physical Servers and Cloud Offerings - Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API

**TEXT BOOK:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

## RADAR SYSTEMS (PROFESSIONAL ELECTIVE – III)

**B.Tech. IV Year I Sem.**  
**Course Code: EC733PE**

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

**Prerequisite:** Analog and Digital Communications

### Course Objectives:

- To explore the concepts of radar and its frequency bands.
- To understand Doppler effect and get acquainted with the working principles of CW radar, FM-CW radar.
- To impart the knowledge of functioning of MTI and Tracking Radars.
- To explain the designing of a Matched Filter in radar receivers.

**Course Outcomes:** Upon completing this course, the student will be able to

- Derive the complete radar range equation.
- Understand the need and functioning of CW, FM-CW and MTI radars
- Known various Tracking methods.
- Derive the matched filter response characteristics for radar receivers.

### UNIT – I

**Basics of Radar:** Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation.

**Radar Equation:** SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment).

### UNIT – II

**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, FM-CW altimeter.

### UNIT - III

**MTI and Pulse Doppler Radar:** Principle, MTI Radar - 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, MTI versus Pulse Doppler Radar.



#### **UNIT – IV**

**Tracking Radar:** Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

#### **UNIT – V**

**Detection of Radar Signals in Noise** Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

**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, Applications, Advantages and Limitations.

#### **TEXT BOOK:**

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2<sup>nd</sup>Ed., 2007.

#### **REFERENCE BOOKS:**

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013
4. Radar Handbook - Merrill I. Skolnik, 3<sup>rd</sup> Ed., McGrawHill Education, 2008.

## EMBEDDED SYSTEM DESIGN

### (Professional Elective - III)

**B.Tech. IV Year I Sem.**

**Course Code: EI701PC/EC734PE/ET742PE**

<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 an overview of Design Principles of Embedded System.
- To provide clear understanding about the role of firmware, operating systems in correlation with hardware systems.

#### Course Outcomes:

- Expected to understand the selection procedure of Processors in the embedded domain.
- Design Procedure for Embedded Firmware.
- Expected to visualize the role of Real time Operating Systems in Embedded Systems.
- Expected to evaluate the Correlation between task synchronization and latency issues

#### UNIT - I

**Introduction to Embedded Systems:** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

#### UNIT - II

**Typical Embedded System:** Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS).  
**Memory:** ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

#### UNIT - III

**Embedded Firmware:** Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

#### UNIT - IV

**RTOS Based Embedded System Design:** Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

#### UNIT - V

**Task Communication:** Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

**TEXT BOOKS:**

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

**REFERENCE BOOKS:**

1. Embedded Systems - Raj Kamal, MC GRAW HILL EDUCATION.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

## OPTIMIZATION TECHNIQUES (PROFESSIONAL ELECTIVE – IV)

**B.Tech. IV Year I Sem.**

**Course Code: EE734PE/EC741PE**

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

**Prerequisite:** Mathematics –I & Mathematics –II

### Course Objectives:

- To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
- Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
- To explain the concept of Dynamic programming and its applications to project implementation.

**Course Outcomes:** After completion of this course, the student will be able to

- explain the need of optimization of engineering systems
- understand optimization of electrical and electronics engineering problems
- apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
- apply unconstrained optimization and constrained non-linear programming and dynamic programming
- Formulate optimization problems.

### UNIT – I

**Introduction and Classical Optimization Techniques:** Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

**Classical Optimization Techniques:** Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints.

Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

### UNIT – II

**Linear Programming:** Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

**Transportation Problem:** Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

### **UNIT – III**

**Unconstrained Nonlinear Programming:** One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method

**Unconstrained Optimization Techniques:** Univariant method, Powell's method and steepest descent method.

### **UNIT – IV**

**Constrained Nonlinear Programming:** Characteristics of a constrained problem - classification - Basic approach of Penalty Function method - Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

### **UNIT – V**

**Dynamic Programming:** Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

### **TEXT BOOKS:**

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4<sup>th</sup> edition, 2009.
2. H. S. Kasene & K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd., 2004

### **REFERENCE BOOKS:**

1. George Bernard Dantzig, Mukund Narain Thapa, "Linear programming", Springer series in operations research 3<sup>rd</sup> edition, 2003.
2. H.A. Taha, "Operations Research: An Introduction", 8<sup>th</sup> Edition, Pearson/Prentice Hall, 2007.
3. Kalyanmoy Deb, "Optimization for Engineering Design – Algorithms and Examples", PHI Learning Pvt. Ltd, New Delhi, 2005.

## OBJECT ORIENTED PROGRAMMING (PROFESSIONAL ELECTIVE – IV)

**B.Tech. IV Year I Sem.**  
**Course Code: EC742PE**

<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 introduce the object-oriented programming concepts.
- To understand object-oriented programming concepts, and apply them in solving problems.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
- To introduce the implementation of packages and interfaces
- To introduce the concepts of exception handling and multithreading.
- To introduce the design of Graphical User Interface using applets and swing controls.

### Course Outcomes

- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstract classes.
- Able to solve problems using java collection framework and I/o classes.
- Able to develop multithreaded applications with synchronization.
- Able to develop applets for web applications.
- Able to design GUI based applications

### UNIT - I

**Object-oriented thinking-** A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling.

**Inheritance**– Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.

### UNIT - II

**Packages-** Defining a Package, CLASSPATH, Access protection, importing packages.

**Interfaces-** defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.

**Stream based I/O(java.io)** – The Stream Classes-Byte streams and Character streams, reading console Input and Writing Console Output, File class, Reading and writing Files,

Random access file operations, The Console class, Serialization, Enumerations, auto boxing, generics.

### UNIT - III

**Exception handling** - Fundamentals of exception handling, Exception types, Termination or resumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

**Multithreading**- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

### UNIT - IV

**The Collections Framework (java.util)**- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable, Properties, Stack, Vector  
More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner

### UNIT - V

**GUI Programming with Swing** – Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

**Event Handling**- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.

A Simple Swing Application, **Applets** – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs.

### TEXT BOOKS:

1. Java The complete reference, 9<sup>th</sup> edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

### REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.

4. Programming in Java, S. Malhotra, S. Chudhary, 2<sup>nd</sup> edition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.



## ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PROFESSIONAL ELECTIVE – IV)

**B.Tech. IV Year I Sem.**  
**Course Code: EC743PE**

<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:

- It provides an understanding of various measuring systems functioning and metrics for performance analysis.
- Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

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

- Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

### UNIT - I

**Block Schematics of Measuring Systems:** Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multi meters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

### UNIT - II

**Signal Analyzers:** AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

### UNIT - III

**Oscilloscopes:** CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

**Special Purpose Oscilloscopes:** Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

#### **UNIT - IV**

**Transducers:** Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

#### **UNIT - V**

**Bridges:** Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

**Measurement of Physical Parameters:** Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

#### **TEXT BOOKS:**

1. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
2. Electronic Instrumentation: H. S. Kalsi – Mc Graw Hill Education, 2<sup>nd</sup> Edition 2004.
3. Electronic Instrumentation and Measurements – David A. Bell, 3rd Edition Oxford Univ. Press, 2013.

#### **REFERENCES:**

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbins, W.D. Cooper: PHI 5<sup>th</sup> Edition 2003.
3. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage MC GRAW HILL EDUCATION Reprint 2009.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

## ARTIFICIAL INTELLIGENCE (PROFESSIONAL ELECTIVE – IV)

**B.Tech. IV Year I Sem.**

**Course Code: IT733PE/EC744PE**

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

**Prerequisites:**

1. A course on “Computer Programming and Data Structures”
2. A course on “Advanced Data Structures”
3. A course on “Design and Analysis of Algorithms”
4. A course on “Mathematical Foundations of Computer Science”
5. Some background in linear algebra, data structures and algorithms, and probability will all be helpful

**Course Objectives:**

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

**UNIT - I**

**Problem Solving by Search-I:** Introduction to AI, Intelligent Agents

**Problem Solving by Search –II:** Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A\* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment .

**UNIT - II**

**Problem Solving by Search-II and Propositional Logic**

**Adversarial Search:** Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

**Constraint Satisfaction Problems:** Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

**Propositional Logic:** Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

### UNIT - III

#### Logic and Knowledge Representation

**First-Order Logic:** Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

### UNIT - IV

#### Planning

**Classical Planning:** Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**Planning and Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

### UNIT - V

#### Uncertain knowledge and Learning

**Uncertainty:** Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

**Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

**Learning:** Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

### TEXT BOOKS

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

**REFERENCES:**

1. Artificial Intelligence, 3<sup>rd</sup> Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3<sup>rd</sup> Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

**VLSI DESIGN****B.Tech. IV Year I Sem.****Course Code: EC702PC/ET721PE/EI741PE**

<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:** The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors, and passive components.
- Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits.

**Course Outcomes:** Upon successfully completing the course, the student should be able to:

- Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
- Choose an appropriate inverter depending on specifications required for a circuit
- Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
- Design different types of logic gates using CMOS inverter and analyze their transfer characteristics
- Provide design concepts required to design building blocks of data path using gates.
- Design simple memories using MOS transistors and can understand design of large memories.
- Design simple logic circuit using PLA, PAL, FPGA and CPLD.
- Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system

**UNIT – I****Introduction:** Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS**Basic Electrical Properties:** Basic Electrical Properties of MOS and BiCMOS Circuits:  $I_{ds}$ - $V_{ds}$  relationships, MOS transistor threshold Voltage,  $g_m$ ,  $g_{ds}$ , Figure of merit  $\omega_0$ ; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.**UNIT - II****VLSI Circuit Design Processes:** VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2  $\mu$ m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

### **UNIT – III**

**Gate Level Design:** Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

### **UNIT - IV**

**Data Path Subsystems:** Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

**Array Subsystems:** SRAM, DRAM, ROM, Serial Access Memories.

### **UNIT - V**

**Programmable Logic Devices:** PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

**CMOS Testing:** CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

### **TEXT BOOKS:**

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3<sup>rd</sup> Ed, Pearson, 2009.

### **REFERENCE BOOKS:**

1. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.

**VLSI & E-CAD LAB**

**B.Tech. IV Year I Sem.**  
**Course Code: EC703PC**

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

**List of Experiments**

Design and implementation of the following CMOS digital/analog circuits using **Cadence / Mentor Graphics / Synopsys /Equivalent** CAD tools. The design shall include Gate-level design, Transistor-level design, Hierarchical design, Verilog HDL/VHDL design, Logic synthesis, Simulation and verification, Scaling of CMOS Inverter for different technologies, study of secondary effects ( temperature, power supply and process corners), Circuit optimization with respect to area, performance and/or power, Layout, Extraction of parasitics and back annotation, modifications in circuit parameters and layout consumption, DC/transient analysis, Verification of layouts (DRC, LVS)

**E-CAD programs:**

Programming can be done using any compiler. Down load the programs on FPGA/CPLD boards and performance testing may be done using pattern generator (32 channels) and logic analyzer apart from verification by simulation with any of the front end tools.

1. HDL code to realize all the logic gates
2. Design of 2-to-4 decoder
3. Design of 8-to-3 encoder (without and with priority)
4. Design of 8-to-1 multiplexer and 1-to-8 demultiplexer
5. Design of 4 bit binary to gray code converter
6. Design of 4 bit comparator
7. Design of Full adder using 3 modeling styles
8. Design of flip flops: SR, D, JK, T
9. Design of 4-bit binary, BCD counters ( synchronous/ asynchronous reset) or any sequence counter
10. Finite State Machine Design

**VLSI programs:**

- Introduction to layout design rules. Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and crosstalk analysis of the following:
  1. Basic logic gates
  2. CMOS inverter
  3. CMOS NOR/ NAND gates
  4. CMOS XOR and MUX gates
  5. Static / Dynamic logic circuit (register cell)
  6. Latch
  7. Pass transistor
  8. Layout of any combinational circuit (complex CMOS logic gate).
  9. Analog Circuit simulation (AC analysis) – CS & CD amplifier

**Note:** Any **SIX** of the above experiments from each part are to be conducted (Total 12)



**MICROWAVE ENGINEERING LAB**

**B.Tech. IV Year I Sem.**  
**Course Code: EC704PC**

<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**

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement of Matched load
5. VSWR measurement of with open and short circuit loads
6. Measurement of Waveguide Parameters
7. Measurement of Impedance of a given Load
8. Measurement of Scattering Parameters of a E plane Tee
9. Measurement of Scattering Parameters of a H plane Tee
10. Measurement of Scattering Parameters of a Magic Tee
11. Measurement of Scattering Parameters of a Circulator
12. Attenuation Measurement
13. Microwave Frequency Measurement
14. Antenna Pattern Measurements.

## NETWORK SECURITY AND CRYPTOGRAPHY (PROFESSIONAL ELECTIVE – V)

**B.Tech. IV Year II Sem.**  
**Course Code: EC851PE**

<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:

- Understand the basic concept of Cryptography and Network Security, their mathematical models
- To understand the necessity of network security, threats/vulnerabilities to networks and countermeasures
- To understand Authentication functions with Message Authentication Codes and Hash Functions.
- To provide familiarity in Intrusion detection and Firewall Design Principles

**Course Outcomes:** Upon completing this course, the student will be able to

- Describe network security fundamental concepts and principles
- Encrypt and decrypt messages using block ciphers and network security technology and protocols
- Analyze key agreement algorithms to identify their weaknesses
- Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities

### UNIT - I

Security Services, Mechanisms and Attacks, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

**Modern Techniques:** Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

### UNIT - II

**Encryption:** Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block Ciphers. Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

### UNIT – III

**Public Key Cryptography:** Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

**Number Theory:** Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

#### **UNIT - IV**

**Message Authentication and Hash Functions:** Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

**Hash and Mac Algorithms:** MD-5, Message digest Algorithm, Secure Hash Algorithm.

Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

**Authentication Applications:** Kerberos, Electronic Mail Security: Pretty Good Privacy, SIME/MIME.

#### **UNIT – V**

**IP Security:** Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

**Intruders, Viruses and Worms:** Intruders, Viruses and Related threats.

**Fire Walls:** Fire wall Design Principles, Trusted systems.

#### **TEXT BOOKS:**

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH,2004.

#### **REFERENCE BOOKS:**

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
3. Principles of Information Security, Whitman, Thomson.
4. Introduction to Cryptography, Buchmann, Springer.

**SYSTEM DESIGN USING FPGAs  
(PROFESSIONAL ELECTIVE – V)**

**B.Tech. IV Year II Sem.**  
**Course Code: EC852PE**

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

**Prerequisite:** Switching Theory and Logic Design

**UNIT - I**

Integrated Design Process and Methodology, Hardware Descriptive language and digital circuit primitives- Flip flop, latch, Three state Buffer, combinational gates, HDL Synthesis Rules, pads.

HDL Simulation Environment, Synthesis Environment, synthesis Technology library, HDL Design process for a Block.

**UNIT - II**

**Design of Basic Combinational circuits through VHDL/Verilog HDL**

Selectors, Encoder, Code Converter, Equality Checker, Comparators, Half adder, Full adder, Carry ripple adder, carry look ahead adder, Count one circuit, leading zero Circuit, Barrel Shifter.

**UNIT - III**

**Design of Basic Sequential Circuit Through VHDL/Verilog HDL**

Signal manipulator, counter, Shift Register, Parallel to serial Converter, Serial to parallel convertor, General framework to design registers- Interrupt Registers, DMA and control Register, configuration registers, Register Block partitioning and synthesis.

**UNIT - IV**

**Clock and Reset Circuits**

Clock Buffer and Clock Tree, Clock Tree generation, Reset Circuitry, Clock Skew and Fixes, Synchronization between clock domains, clock Divider, Gated clock.

**UNIT - V**

**Design Case Study**

Design Description, Design partition, Design verification, Design Synthesis, Worst-case Timing analysis, Best-case Timing Analysis, Net list Generation, Post layout Verification, Design Management.

**TEXT BOOK:**

1. Digital Systems Design with VHDL and Synthesis – K. C. Chang, Wiley-India Edition

## OPTICAL COMMUNICATIONS (PROFESSIONAL ELECTIVE – V)

**B.Tech. IV Year II Sem.**  
**Course Code: EC853PE**

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

**Prerequisite:** Analog Communications and Digital Communications

**Course Objectives:** The objectives of the course are:

- To realize the significance of optical fibre communications.
- To understand the construction and characteristics of optical fibre cable.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To understand the design of optical systems and WDM.

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

- Understand and analyze the constructional parameters of optical fibres.
- Be able to design an optical system.
- Estimate the losses due to attenuation, absorption, scattering and bending.
- Compare various optical detectors and choose suitable one for different applications.

### 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, Vnumber, Mode Coupling, Step Index Fibers, Graded Index Fibers.

**Single Mode Fibers-** Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalcogenide Glass, Plastic Optical Fibers.

### UNIT - II

**Signal Distortion in Optical Fibers:** Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

### UNIT - III

**Fiber Splicing:** Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints.

**Optical Sources-** LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External

Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

**Source to Fiber Power Launching:** - Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

#### **UNIT - IV**

**Optical Detectors:** Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation- Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

#### **UNIT - V**

**Optical System Design:** Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples.

Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

#### **TEXT BOOKS:**

1. Optical Fiber Communications – Gerd Keiser, TMH, 4<sup>th</sup> Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3<sup>rd</sup> Edition, 2009.

#### **REFERENCE BOOKS:**

1. Fiber Optic Communications – D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C. Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Edition, 2004.
4. Introduction to Fiber Optics by Donald J. Sterling Jr. – Cengage learning, 2004.
5. Optical Communication Systems – John Gower, 2<sup>nd</sup> Edition, PHI, 2001.

## MACHINE LEARNING (PROFESSIONAL ELECTIVE – V)

**B.Tech. IV Year II Sem.**

**Course Code: EC854PE/EI864PE**

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

**Prerequisites:**

- Data Structures
- Knowledge on statistical methods

**Course Objectives:**

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

**Course Outcomes:**

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

### UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

**Decision Tree Learning** – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

### UNIT - II

**Artificial Neural Networks-1**– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

**Artificial Neural Networks-2**- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

**Evaluation Hypotheses** – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

**UNIT - III**

**Bayesian learning** – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

**Computational learning theory** – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

**Instance-Based Learning**- Introduction,  $k$ -nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

**UNIT - IV**

**Genetic Algorithms** – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

**Learning Sets of Rules** – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

**Reinforcement Learning** – Introduction, the learning task, Q-learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

**UNIT - V**

**Analytical Learning-1**- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

**Analytical Learning-2**-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

**Combining Inductive and Analytical Learning** – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

**TEXT BOOK:**

1. Machine Learning – Tom M. Mitchell, - MGH

**REFERENCE:**

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis



## **ACTUATORS AND ROBOT SYSTEMS** **(PROFESSIONAL ELECTIVE – VI)**

**B.Tech. IV Year II Sem.**  
**Course Code: EC861PE**

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

### **UNIT - I**

#### **Introduction & Basic Definitions**

Introduction, Control Programs for Robots, Industry Applications of Robots, Pick and Place, Gantry and Arm type Robots in typical set-ups like Automobile Industry

Coordinate Systems: Cartesian, Cylindrical, Polar, and Revolute systems: Robot Positioning: Robot Arms; Axes, their ranges, offset and In-line Wrist: Roll, Pitch and Yaw, their meaning in Robotics

### **UNIT - II**

#### **Mechanical Aspects**

Kinematics, Inverse Kinematics, Motion Planning and Mobile Mechanisms

### **UNIT - III**

#### **Sensors and Applications**

Range and Use of Sensors, Microswitches, Resistance Transducers, Piezo-electric, Infrared and Lasers Applications of Sensors: Reed Switches, Ultrasonic, Barcode Readers and RFID

### **UNIT - IV**

#### **Robot Systems**

Hydraulic and Electrical Systems Including Pumps, valves, solenoids, cylinders, stepper motors, Encoders and AC Motors

### **UNIT - V**

#### **Programming of Robots**

Programming of Robots such as Lego Robots, Programming environment, Example Applications, Safety considerations

### **TEXT BOOKS:**

1. Introduction to Robotics – P.J. Mckerrow, ISBN: 0201182408
2. Introduction to Robotics – S. Nikv, 2001, Prentice Hall,
3. Mechatronics and Robotics: Design & Applications – A. Mutanbara, 1999, CRC Press.

### **REFERENCE BOOK:**

1. Robotics – K.S. Fu, R.C. Gonzalez and C.S.G. Lee, 2008, TMH.

## ANALOG CMOS IC DESIGN (PROFESSIONAL ELECTIVE – VI)

**B.Tech. IV Year II Sem.**  
**Course Code: EC862PE**

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

**Pre-Requisite:** Analog Electronics

**Course Objectives:** Analog circuits play a very crucial role in all electronic systems and due to continued miniaturization; many of the analog blocks are not getting realized in CMOS technology.

- To understand most important building blocks of all CMOS analog Ics.
- To study the basic principle of operation, the circuit choices and the tradeoffs involved in the MOS transistor level design common to all analog CMOS ICs.
- To understand specific design issues related to single and multistage voltage, current and differential amplifiers, their output and impedance issues, bandwidth, feedback and stability.
- To understand the design of differential amplifiers, current amplifiers and OP AMPs.

**Course Outcomes:** After studying the course, each student is expected to be able to

- Design basic building blocks of CMOS analog ICs.
- Carry out the design of single and two stage operational amplifiers and voltage references.
- Determine the device dimensions of each MOSFETs involved.
- Design various amplifiers like differential, current and operational amplifiers.

### UNIT - I

#### MOS Devices and Modeling

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

### UNIT - II

#### Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

### UNIT - III

#### CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

#### **UNIT - IV**

##### **CMOS Operational Amplifiers**

Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

#### **UNIT - V**

##### **Comparators**

Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

#### **TEXT BOOKS**

1. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
2. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

#### **REFERENCES**

1. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.
2. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.

## GLOBAL POSITIONING SYSTEM (PROFESSIONAL ELECTIVE – VI)

**B.Tech. IV Year II Sem.**  
**Course Code: EC863PE**

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

### UNIT - I

**Introduction:** Basic concept, system architecture, GPS and GLONASS Overview, Satellite Navigation, Time and GPS, User position and velocity calculations, GPS, Satellite Constellation, Operation Segment, User receiving Equipment, Space Segment Phased development, GPS aided Geoaugmented navigation (GAGAN) architecture.

### UNIT - II

**Signal Characteristics:** GPS signal components, purpose, properties and power level, signal acquisition and tracking, Navigation information extraction, pseudorange estimation, frequency estimation, GPS satellite position calculation, Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

### UNIT - III

**GPS Receivers & Data Errors:** Receiver Architecture, receiver design options, Antenna design, GPS error sources, SA errors, propagation errors, ionospheric error, tropospheric error, multipath, ionospheric error, estimation using dual frequency GPS receiver, Methods of multipath mitigation, Ephemeris data errors, clock errors.

### UNIT - IV

**Differential GPS:** Introduction, LADGPS, WADGPS, Wide Area Augmentation systems, GEO Uplink subsystem, GEO downlink systems, Geo Orbit determination, Geometric analysis, covariance analysis, GPS /INS Integration Architectures

### UNIT - V

**GPS Applications:** GPS in surveying, Mapping and Geographical Information System, Precision approach Aircraft landing system, Military and Space application, intelligent transportation system.

GPS orbital parameters, description of receiver independent exchange format (RINEX) , Observation data and navigation message data parameters, GPS position determination, least squares method

### TEXT BOOK:

1. Mohinder S.Grewal, Lawrence R.Weill, Angus P.Andrews, “Global positioning systems, Inertial Navigation and Integration”, Wiley 2007.

### REFERENCE:

1. E.D.Kaplan, Christopher J. Hegarty, “Understanding GPS Principles and Applications”, Artech House Boston 2005.

## COMPUTER VISION (PROFESSIONAL ELECTIVE – VI)

**B.Tech. IV Year II Sem.**  
**Course Code: EC864PE**

<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 review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand three-dimensional image analysis techniques.
- To understand motion analysis.
- To study some applications of computer vision algorithms.

**Course Outcomes:** Upon completion of this course, the students should be able to

- Implement fundamental image processing techniques required for computer vision.
- Perform shape analysis.
- Implement boundary tracking techniques.
- Apply chain codes and other region descriptors.
- Apply Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques.
- Implement motion related techniques.
- Develop applications using computer vision techniques.

### UNIT - I

**Image Processing Foundations:** Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

### UNIT - II

**Shapes and Regions:** Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

### UNIT - III

**Hough Transform:** Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

**UNIT - IV**

**3D Vision and Motion:** Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

**UNIT - V**

**Applications:** Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

**TEXT BOOKS:**

1. Simon J. D. Prince, —Computer Vision: Models, Learning, and Inferencel, Cambridge University Press, 2012.
2. Mark Nixon and Alberto S. Aquado, —Feature Extraction & Image Processing for Computer Visionll, Third Edition, Academic Press, 2012.
3. E. R. Davies, —Computer & Machine Vision, Fourth Edition, Academic Press, 2012.

**REFERENCES:**

1. D. L. Baggio et al., —Mastering OpenCV with Practical Computer Vision Projectsll, Packt Publishing, 2012.
2. Jan Erik Solem, —Programming Computer Vision with Python: Tools and algorithms for analyzing images, O'Reilly Media, 2012.
2. R. Szeliski, —Computer Vision: Algorithms and Applicationsll, Springer 2011.

**ACADEMIC REGULATIONS  
COURSE STRUCTURE  
AND  
DETAILED SYLLABUS**

**4**

**ELECTRONICS AND  
COMMUNICATION  
ENGINEERING**

**For**  
**B.TECH. FOUR YEAR DEGREE COURSE**  
(Applicable for the batches admitted from 2013-14)  
(I - IV Years Syllabus)



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**KUKATPALLY, HYDERABAD - 500 085.**





**ACADEMIC REGULATIONS R13 FOR B. TECH. (REGULAR)**

**Applicable for the students of B. Tech. (Regular) from the Academic Year 2013-14 and onwards**

**1. Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:

- 1.1 The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.
- 1.2 After eight academic years of course of study, the candidate is permitted to write the examinations for two more years.
- 1.3 The candidate shall register for 224 credits and secure 216 credits with compulsory subjects as listed in Table-1.

**Table 1: Compulsory Subjects**

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-Voce
4	Seminar
5	Project work

- 2 The students, who fail to fulfill all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Tech. course.

**3 Courses of study**

The following courses of study are offered at present as specializations for the B. Tech. Course:

Branch Code	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering
05	Computer Science and Engineering
08	Chemical Engineering
10	Electronics and Instrumentation Engineering

11	Bio-Medical Engineering
12	Information Technology
14	Mechanical Engineering (Mechatronics)
17	Electronics and Telematics Engineering
18	Metallurgy and Material Technology
19	Electronics and Computer Engineering
20	Mechanical Engineering (Production)
21	Aeronautical Engineering
22	Instrumentation and Control Engineering
23	Biotechnology
24	Automobile Engineering
25	Mining Engineering
26	Mining Machinery
27	Petroleum Engineering
28	Civil and Environmental Engineering
29	Mechanical Engineering (Nano Technology)
30	Agricultural Engineering
31	Computer Science & Technology

#### 4 Credits

	I Year		Semester	
	Periods / Week	Credits	Periods / Week	Credits
Theory	03+1/03	06	04	04
	02	04	—	—
Practical	03	04	03	02
Drawing	02+03	06	03 06	02 04
Mini Project	—	—	—	02
Comprehensive Viva Voce	—	—	—	02
Seminar	—	—	6	02
Project	—	--	15	10

**5 Distribution and Weightage of Marks**

- 5.1 The performance of a student in each semester or I year shall be evaluated subject-wise for a maximum of 100 marks for a theory and 75 marks for a practical subject. In addition, industry-oriented mini-project, seminar and project work shall be evaluated for 50, 50 and 200 marks, respectively.
- 5.2 For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.
- 5.3 For theory subjects, during a semester there shall be 2 mid-term examinations. Each mid-term examination consists of one objective paper, one essay paper and one assignment. The objective paper and the essay paper shall be for 10 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The Objective paper is set with 20 bits of multiple choice, fill-in the blanks and matching type of questions for a total of 10 marks. The essay paper shall contain 4 full questions (one from each unit) out of which, the student has to answer 2 questions, each carrying 5 marks. While the first mid-term examination shall be conducted on 1 to 2.5 units of the syllabus, the second mid-term examination shall be conducted on 2.5 to 5 units. Five (5) marks are allocated for Assignments (as specified by the subject teacher concerned). The first Assignment should be submitted before the conduct of the first mid-examination, and the second Assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate. However, in the I year, there shall be 3 mid term examinations, each for 25 marks, along with 3 assignments in a similar pattern as above (1<sup>st</sup> mid shall be from Unit-I, 2<sup>nd</sup> mid shall be 2 & 3 Units and 3<sup>rd</sup> mid shall be 4 & 5 Units) and the average marks of the examinations secured (each evaluated for a total of 25 marks) in each subject shall be considered to be final marks for the internals/sessionals. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the University.

***The details of the Question Paper pattern without deviating from the R13 regulations as notified in the website is as follows:***

- ***The End semesters Examination will be conducted for 75 marks which consists of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.***
- ***Part-A is compulsory question which consists of ten sub-questions. The first five sub-questions are from each unit and carries 2 marks each. The next five sub-questions***

**are one from each unit and carries 3 marks each.**

- **Part-B consists of five Questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice (that means there will be two questions from each unit and the student should answer any one question)**

- 5.4 For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the University.
- 5.5 For the subject having design and/or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and Estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for internal tests) and 75 marks for end semester examination. There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests. However, in the I year class, there shall be three tests and the average will be taken into consideration.
- 5.6 There shall be an industry-oriented Mini-Project, in collaboration with an industry of their specialization, to be taken up during the vacation after III year II Semester examination. However, the mini-project and its report shall be evaluated along with the project work in IV year II Semester. The industry oriented mini-project shall be submitted in a report form and presented before the committee. It shall be evaluated for 50 marks. The committee consists of an external examiner, head of the department, the supervisor of the mini-project and a senior faculty member of the department. There shall be no internal marks for industry-oriented mini-project.
- 5.7 There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding of the topic, and submit it to the department. It shall be evaluated by the departmental committee consisting of head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for the seminar.
- 5.8 There shall be a Comprehensive Viva-Voce in IV year II semester.

The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he studied during the B. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

- 5.9 Out of a total of 200 marks for the project work, 50 marks shall be allotted for Internal Evaluation and 150 marks for the End Semester Examination (Viva Voce). The End Semester Examination of the project work shall be conducted by the same committee as appointed for the industry-oriented mini-project. In addition, the project supervisor shall also be included in the committee. The topics for industry oriented mini project, seminar and project work shall be different from one another. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.
- 5.10 The Laboratory marks and the sessional marks awarded by the College are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University rules and produced before the Committees of the University as and when asked for.

## **6 Attendance Requirements**

- 6.1 A student is eligible to write the University examinations only if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- 6.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee
- 6.3 Shortage of Attendance below 65% in aggregate shall not be condoned.
- 6.4 A student who is short of attendance in semester / I year may seek re-admission into that semester/I year when offered within 4 weeks from the date of the commencement of class work.
- 6.5 Students whose shortage of attendance is not condoned in any semester/I year are not eligible to write their end semester examination of that class and their registration stands cancelled.

- 6.6 A stipulated fee shall be payable towards condonation of shortage of attendance.
- 6.7 A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester/I year, as applicable, including the days of attendance in sports, games, NCC and NSS activities.
- 6.8 If any candidate fulfills the attendance requirement in the present semester or I year, he shall not be eligible for readmission into the same class.

**7 Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6.

- 7.1 A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.
- 7.2 A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.
- 7.3 A student will not be promoted from II year to III year unless he fulfills the academic requirement of 34 credits up to II year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
- 7.4 A student shall be promoted from III year to IV year only if he fulfills the academic requirements of 56 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.
- 7.5 A student shall register and put up minimum attendance in all 224 credits and earn 216 credits. Marks obtained in the best 216 credits shall be considered for the calculation of percentage of marks.
- 7.6 Students who fail to earn 216 credits as indicated in the course structure within ten academic years (8 years of study + 2 years additionally for appearing for exams only) from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

**8 Course pattern**

- 8.1 The entire course of study is for four academic years. I year shall be on yearly pattern and II, III and IV years on semester pattern.
- 8.2 A student, eligible to appear for the end examination in a subject, but absent from it or has failed in the end semester examination, may

write the exam in that subject during the period of supplementary exams.

- 8.3 When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the next semester/year. However, the academic regulations under which he was first admitted, shall continue to be applicable to him.

**9 Award of Class**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

<b>Class Awarded</b>	<b>% of marks to be secured</b>	<b>From the aggregate marks secured from 216 Credits.</b>
First Class with Distinction	70% and above	
First Class	Below 70 but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in internal evaluation and end semester / I year examination shall be shown separately in the memorandum of marks.

**10 Minimum Instruction Days**

The minimum instruction days for each semester/I year shall be 90/180 days.

- 11 There shall be no branch transfers after the completion of the admission process.
- 12 There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

**13 WITHHOLDING OF RESULTS**

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

**14. TRANSITORY REGULATIONS**

- 14.1 Discontinued, detained, or failed candidates are eligible for readmission as and when next offered.
- 14.2 After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot

clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to pass in order to obtain the required number of credits.

- 14.3 In case of transferred students from other Universities, the credits shall be transferred to JNTUH as per the academic regulations and course structure of the JNTUH.

**15. General**

- 15.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- 15.2 The academic regulation should be read as a whole for the purpose of any interpretation.
- 15.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 15.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.
- 15.5 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/Institutions, have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the candidates have not studied at the earlier Institution on their own without the right to sessional marks. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the candidates have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

\* \* \*



**Academic Regulations R13 For B.Tech. (Lateral Entry Scheme)**

Applicable for the students admitted into II year B. Tech. (LES) from the Academic Year 2013-14 and onwards

**1 Eligibility for award of B. Tech. Degree (LES)**

- I. The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.
- II. They shall be permitted to write the examinations for two more years after six academic years of course work.

2. The candidate shall register for 168 credits and secure 160 credits from II to IV year B.Tech. Program (LES) for the award of B.Tech. degree with compulsory subjects as listed in Table-1.

**Table 1: Compulsory Subjects**

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-Voce
4	Seminar
5	Project work

3. The students, who fail to fulfil the requirement for the award of the degree in 8 consecutive academic years (6 years of study + 2 years additionally for appearing exams only) from the year of admission, shall forfeit their seats.
4. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech. (LES).
5. **Promotion Rule**  
 A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.  
 A student shall be promoted from III year to IV year only if he fulfills the academic requirements of 34 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations.
6. **Award of Class**  
 After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	From the aggregate marks secured from 216 Credits.
First Class with Distinction	70% and above	
First Class	Below 70 but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

The marks obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

7. All the other regulations as applicable to **B. Tech. 4-year degree course (Regular)** will hold good for **B. Tech. (Lateral Entry Scheme)**.

#### MALPRACTICES RULES

##### DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.

2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	<p>Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.</p> <p>The Hall Ticket of the candidate is to be cancelled and sent to the University.</p>
3.	Impersonates any other candidate in connection with the examination.	<p>The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.</p>

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is

	any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work

		and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical

12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	
-----	---	--

**Malpractices identified by squad or special invigilators**

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
  - (i) A show cause notice shall be issued to the college.
  - (ii) Impose a suitable fine on the college.
  - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD.****B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING****I YEAR**

Code	Subject	L	T/P/D	C
A10001	English	2	-	4
A10002	Mathematics – I	3	1	6
A10003	Mathematical Methods	3	-	6
A10004	Engineering Physics	3	-	6
A10005	Engineering Chemistry	3	-	6
A10501	Computer Programming	3	-	6
A10301	Engineering Drawing	2	3	6
A10581	Computer Programming Lab.	-	3	4
A10081	Engineering Physics / Engineering Chemistry Lab.	-	3	4
A10083	English Language Communication Skills Lab.	-	3	4
A10082	IT Workshop / Engineering Workshop	-	3	4
	<b>Total</b>	<b>19</b>	<b>16</b>	<b>56</b>

**II YEAR I SEMESTER**

Code	Subject	L	T/P/D	C
A30007	Mathematics - III	4	-	4
A30405	Probability Theory and Stochastic Processes	4	-	4
A30407	Switching Theory and Logic Design	4	-	4
A30204	Electrical Circuits	4	-	4
A30404	Electronic Devices and Circuits	4	-	4
A30406	Signals and Systems	4	-	4
A30482	Electronic Devices and Circuits Lab.	-	3	2
A30481	Basic Simulation Lab.	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>



**II YEAR II SEMESTER**

Code	Subject	L	T/P/D	C
A40215	Principles of Electrical Engineering	4	-	4
A40412	Electronic Circuit Analysis	4	-	4
A40415	Pulse and Digital Circuits	4	-	4
A40009	Environmental Studies	4	—	4
A40411	Electromagnetic Theory and Transmission Lines	4	-	4
A40410	Digital Design using Verilog HDL	4	-	4
A40288	Electrical Technology Lab.	-	3	2
A40484	Electronic Circuits and Pulse Circuits Lab.	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>

**III YEAR I SEMESTER**

Code	Subject	L	T/P/D	C
A50217	Control Systems Engineering	4	-	4
A50516	Computer Organization and Operating Systems	4	-	4
A50418	Antennas and Wave Propagation	4	-	4
A50422	Electronic Measurements and Instrumentation	4	-	4
A50408	Analog Communications	4	-	4
A50425	Linear and Digital IC Applications	4	-	4
A50482	Analog Communications Lab.	-	3	2
A50488	IC Applications and HDL Simulation Lab.	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>

**III YEAR II SEMESTER**

Code	Subject	L	T/P/D	C
A60010	Managerial Economics and Financial Analysis	4	-	4
A60018	<b>Open Elective:</b> Human Values and Professional Ethics Disaster Management Intellectual Property Rights	4	-	4
A60117				
A60017				
A60420	Digital Communications	4	-	4
A60432	VLSI Design	4	-	4
A60430	Microprocessors and Microcontrollers	4	-	4
A60421	Digital Signal Processing	4	-	4
A60494	Microprocessors and Microcontrollers Lab.	-	3	2
A60493	Digital Signal Processing Lab.	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>

**IV YEAR I SEMESTER**

Code	Subject	L	T/P/D	C
A70014	Management Science	4	-	4
A70442	Microwave Engineering	4	-	4
A70515	Computer Networks	4	-	4
A70434	Cellular and Mobile Communications	4	-	4
A70436 A70443 A70505	<b>Elective -I:</b> Digital Image Processing Multimedia and Signal Coding Object Oriented Programming through Java	4	-	4
A70447 A70444 A70440	<b>Elective -II:</b> Television Engineering Optical Communications Embedded Systems Design	4	-	4
A70086	Advanced Communication Skills Lab,	-	3	2
A70499	Microwave Engineering and Digital Communications Lab	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>

**IV YEAR II SEMESTER**

Code	Subject	L	T/P/D	C
A80452 A81102 A80527	<b>Elective -III:</b> Satellite Communications Biomedical Instrumentation Artificial Neural Networks	4	-	4
A80431 A80450 A80449	<b>Elective -IV:</b> Telecommunication Switching Systems and Networks Radar Systems Network Security	4	-	4
A80454 A80437 A80451	<b>Elective -V:</b> Wireless Communications and Networks Digital Signal Processors and Architectures RF Circuit Design	4	-	4
A80087	Industry Oriented Mini Project	-	-	2
A80089	Seminar	-	6	2
A80088	Major Project Work	-	15	10
A80090	Comprehensive Viva	-	-	2
	<b>Total</b>	<b>12</b>	<b>21</b>	<b>28</b>

**Note:** All End Examinations (Theory and Practical) are of three hours duration.

**T-Tutorial    L – Theory    P – Practical    D-Drawing    C – Credits**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****2 -/- 4****(A10001) ENGLISH****Introduction:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.

**Objectives:**

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

**SYLLABUS:****Listening Skills:****Objectives**

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.
2. To equip students with necessary training in listening so that they

can comprehend the speech of people of different backgrounds and regions.

*Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

### **Speaking Skills:**

#### Objectives

1. To make students aware of the role of speaking in English and its contribution to their success.
  2. To enable students to express themselves fluently and appropriately in social and professional contexts.
- Oral practice
  - Describing objects/situations/people
  - Role play – Individual/Group activities (Using exercises from the five units of the prescribed text: **Skills Annexe -Functional English for Success**)
  - Just A Minute(JAM) Sessions.

### **Reading Skills:**

#### Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
  2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.
- Skimming the text
  - Understanding the gist of an argument
  - Identifying the topic sentence
  - Inferring lexical and contextual meaning
  - Understanding discourse features
  - Scanning
  - Recognizing coherence/sequencing of sentences

*NOTE : The students will be trained in reading skills using the prescribed text for detailed study.*

*They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.*

### **Writing Skills :**

#### **Objectives**

1. To develop an awareness in the students about writing as an exact and formal skill.
2. To equip them with the components of different forms of writing, beginning with the lower order ones.
  - Writing sentences
  - Use of appropriate vocabulary
  - Paragraph writing
  - Coherence and cohesiveness
  - Narration / description
  - Note Making
  - Formal and informal letter writing
  - Describing graphs using expressions of comparison

#### **TEXTBOOKS PRESCRIBED:**

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Five Units, are prescribed:

**For Detailed study:** First Textbook: "Skills Annexe -Functional English for Success", Published by Orient Black Swan, Hyderabad

#### **For Non-detailed study**

1. **Second text book "Epitome of Wisdom"**, Published by Maruthi Publications, Guntur
  - The course content and study material is divided into Five Units.

#### **Unit –I:**

1. Chapter entitled '**Wit and Humour**' from '**Skills Annexe**' -Functional English for Success, Published by Orient Black Swan, Hyderabad
  2. Chapter entitled '**Mokshagundam Visvesvaraya**' from "**Epitome of Wisdom**", Published by Maruthi Publications, Hyderabad.
- L- Listening For Sounds, Stress and Intonation
- S- Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)
- R- Reading for Subject/ Theme
- W- Writing Paragraphs

- G- Types of Nouns and Pronouns
- V- Homonyms, homophones synonyms, antonyms

#### Unit –II

1. Chapter entitled “**Cyber Age**” from “**Skills Annexe -Functional English for Success**” Published by Orient Black Swan, Hyderabad.
  2. Chapter entitled '**Three Days To See**' from “**Epitome of Wisdom**”, Published by Maruthi Publications, Hyderabad.
- L – Listening for themes and facts
  - S – Apologizing, interrupting, requesting and making polite conversation
  - R- for theme and gist
  - W- Describing people, places, objects, events
  - G- Verb forms
  - V- noun, verb, adjective and adverb

#### Unit –III

1. Chapter entitled '**Risk Management**' from “**Skills Annexe - Functional English for Success**” Published by Orient Black Swan, Hyderabad
  2. Chapter entitled '**Leela's Friend**' by R.K. Narayan from “**Epitome of Wisdom**”, Published by Maruthi Publications, Hyderabad
- L – for main points and sub-points for note taking
  - S – giving instructions and directions; Speaking of hypothetical situations
  - R – reading for details
  - W – note-making, information transfer, punctuation
  - G – present tense
  - V – synonyms and antonyms

#### Unit –IV

1. Chapter entitled '**Human Values and Professional Ethics**' from “**Skills Annexe -Functional English for Success**” Published by Orient Black Swan, Hyderabad
  2. Chapter entitled '**The Last Leaf**' from “**Epitome of Wisdom**”, Published by Maruthi Publications, Hyderabad
- L - Listening for specific details and information
  - S- narrating, expressing opinions and telephone interactions
  - R - Reading for specific details and information
  - W- Writing formal letters and CVs
  - G- Past and future tenses

V- Vocabulary - idioms and Phrasal verbs

#### Unit –V

1. Chapter entitled '**Sports and Health**' from “**Skills Annexe - Functional English for Success**” Published by Orient Black Swan, Hyderabad
2. Chapter entitled '**The Convocation Speech**' by N.R. Narayanmurthy from “**Epitome of Wisdom**”, Published by Maruthi Publications, Hyderabad
- L- Critical Listening and Listening for speaker's tone/ attitude
- S- Group discussion and Making presentations
- R- Critical reading, reading for reference
- W- Project proposals; Technical reports, Project Reports and Research Papers
- G- Adjectives, prepositions and concord
- V- Collocations and Technical vocabulary

Using words appropriately

- \* Exercises from the texts not prescribed shall also be used for classroom tasks.

#### REFERENCES :

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University

Press.

12. Everyday Dialogues in English, Robert J. Dixon, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw – Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publishers

**Outcomes:**

- Usage of English Language, written and spoken.
- Enrichment of comprehension and fluency
- Gaining confidence in using language in verbal situations.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****3 1/-/- 6****(A10002) MATHEMATICS -I****Objectives:** To learn

- The types of Matrices and their properties.
- Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
- The concept of eigenvalues and eigenvectors of a matrix is to reduce a quadratic form into a canonical form through a linear transformation.
- The mean value theorems and to understand the concepts geometrically.
- The functions of several variables and optimization of these functions.
- The evaluation of improper integrals, Beta and Gamma functions.
- Multiple integration and its applications.
- Methods of solving the differential equations of 1<sup>st</sup> and higher order
- The applications of the differential equations to Newton's law of cooling, Natural growth and decay, Bending of beams etc.
- The definition of integral transforms and Laplace Transform.
- Properties of Laplace transform.
- Inverse Laplace Transform.
- Convolution theorem.
- Solution of Differential equations using Laplace transform.

**UNIT-I**

**Theory of Matrices:** Real matrices – Symmetric, skew – symmetric, orthogonal. Complex matrices: Hermitian, Skew-Hermitian and Unitary Matrices. Idempotent matrix, Elementary row and column transformations-Elementary matrix, Finding rank of a matrix by reducing to Echelon and normal forms. Finding the inverse of a non-singular square matrix using row/ column transformations (Gauss- Jordan method). Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix. Solving  $m \times n$  and  $n \times n$  linear system of equations by Gauss elimination.

Cayley-Hamilton Theorem (without proof) – Verification. Finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors. Linear Transformation –

Orthogonal Transformation. Eigen values and eigen vectors of a matrix. Properties of eigen values and eigen vectors of real and complex matrices. Finding linearly independent eigen vectors of a matrix when the eigen values of the matrix are repeated.

Diagonalization of matrix – Quadratic forms up to three variables. Rank – Positive definite, negative definite, semi definite, index, signature of quadratic forms. Reduction of a quadratic form to canonical form.

#### UNIT – II

**Differential calculus methods:** Rolle's Mean value Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function.

Functions of several variables: Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers.

#### UNIT – III

**Improper integration, Multiple integration & applications:** Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions

Multiple integrals – double and triple integrals – change of order of integration-change of variables (polar, cylindrical and spherical) Finding the area of a region using double integration and volume of a region using triple integration.

#### UNIT – IV

**Differential equations and applications :** Overview of differential equations-exact, linear and Bernoulli (NOT TO BE EXAMINED). Applications of first order differential equations – Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type  $f(X) = e^{ax}$ ,  $\sin ax$ ,

$\cos ax$ , and  $x^n$ ,  $e^{ax} V(x)$ ,  $x^n V(x)$ , method of variation of parameters. Applications to bending of beams, Electrical circuits and simple harmonic motion.

#### UNIT – V

**Laplace transform and its applications to Ordinary differential equations**  
Definition of Integral transform, Domain of the function and Kernel for the Laplace transforms. Existence of Laplace transform. Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem –

Dirac's delta function, Periodic function – Inverse Laplace transform by Partial fractions( Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem -- Solving ordinary differential equations by Laplace transforms.

**TEXT BOOKS:**

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

**REFERENCES:**

1. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3<sup>rd</sup> edition, Narosa Publishing House, Delhi.
2. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
3. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.
4. Engineering Mathematics – I by G. Shanker Rao & Others I.K. International Publications.
5. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3<sup>rd</sup> Edi, CRC Press Taylor & Francis Group.
6. Mathematics for Engineers and Scientists, Alan Jeffrey, 6<sup>th</sup> Edi, 2013, Chapman & Hall/ CRC
7. Advanced Engineering Mathematics, Michael Greenberg, Second Edition, Pearson Education.

**Outcome:**

- After learning the contents of this Unit the student is able to write the matrix representation of a set of linear equations and to analyze solutions of system of equations.
- The student will be able to understand the methods of differential calculus to optimize single and multivariable functions.
- The student is able to evaluate the multiple integrals and can apply the concepts to find the Areas, Volumes, Moment of Inertia etc., of regions on a plane or in space.
- The student is able to identify the type of differential equation and uses the right method to solve the differential equation. Also able to apply the theory of differential equations to the real world problems.
- The student is able to solve certain differential equations using Laplace Transform. Also able to transform functions on time domain to frequency domain using Laplace transforms.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****3 -/- 6****(A10003) MATHEMATICAL METHODS****Objectives:**

- The objective is to find the relation between the variables x and y out of the given data (x,y).
- This unit also aims to find such relationships which exactly pass through data or approximately satisfy the data under the condition of least sum of squares of errors.
- The aim of numerical methods is to provide systematic methods for solving problems in a numerical form using the given initial data.
- This topic deals with methods to find roots of an equation and solving a differential equation.
- The numerical methods are important because finding an analytical procedure to solve an equation may not be always available.
- In the diverse fields like electrical circuits, electronic communication, mechanical vibration and structural engineering, periodic functions naturally occur and hence their properties are very much required.
- Indeed, any periodic and non-periodic function can be best analyzed in one way by Fourier series and transforms methods.
- The unit aims at forming a partial differential equation (PDE) for a function with many variables and their solution methods. Two important methods for first order PDE's are learnt. While separation of variables technique is learnt for typical second order PDE's such as Wave, Heat and Laplace equations.
- In many Engineering fields the physical quantities involved are vector-valued functions.
- Hence the unit aims at the basic properties of vector-valued functions and their applications to line integrals, surface integrals and volume integrals.

**UNIT – I:****Interpolation and Curve fitting:**

**Interpolation:** Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols- Difference Equations – Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –

Interpolation with unevenly spaced points-Lagrange's Interpolation formula.  
B. Spline interpolation – Cubic spline.

**Curve fitting:** Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

#### **UNIT – II :**

##### **Numerical techniques:**

**Solution of Algebraic and Transcendental Equations and Linear system of equations:** Introduction – Graphical interpretation of solution of equations .The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method .

Solving system of non-homogeneous equations by L-U Decomposition method(Crout's Method)Jacobi's and Gauss-Seidel Iteration method

**Numerical Differentiation, Integration, and Numerical solutions of First order differential equations:** Numerical differentiation, Numerical integration - Trapezoidal rule, Simpson's 1/3<sup>rd</sup> and 3/8 Rule , Generalized Quadrature.

**Numerical solution of Ordinary Differential equations:** Solution by Taylor's series method –Picard's Method of successive Approximation- single step methods-Euler's Method-Euler's modified method, Runge-Kutta Methods, Predictor –corrector methods(Milne's Method and Adams-Bashforth methods only).

#### **UNIT – III:**

**Fourier series and Fourier Transforms:** Definition of periodic function.

Fourier expansion of periodic functions in a given interval of length  $2\pi$   
Determination of Fourier coefficients – Fourier series of even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

Fourier integral theorem - Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

#### **UNIT-IV:**

**Partial differential equations :** Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and non-linear equations (Charpit's method), Method of separation of variables for second order equations –Applications of Partial differential equations-Two dimensional wave equations, Heat equation.

#### **UNIT – V**

**Vector Calculus:** Vector Calculus: Scalar point function and vector point

function, Gradient- Divergence- Curl and their related properties - Laplacian operator, Line integral – work done – Surface integrals -Volume integral. Green's Theorem, Stoke's theorem and Gauss's Divergence Theorems (Statement & their Verification). Solenoidal and irrotational vectors, Finding Potential function.

**TEXT BOOKS:**

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

**REFERENCES:**

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi & Others, S. Chand.
2. Introductory Methods by Numerical Analysis by S.S. Sastry, PHI Learning Pvt. Ltd.
3. Mathematical Methods by G.Shankar Rao, I.K. International Publications, N.Delhi
4. Mathematical Methods by V. Ravindranath, Etl, Himalaya Publications.
5. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3<sup>rd</sup> Edi, 2013, CRC Press Taylor & Francis Group.
6. Mathematics for Engineers and Scientists, Alan Jeffrey, 6<sup>th</sup> Edi, 2013, Chapman & Hall/ CRC
7. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.

**Outcomes:**

From a given discrete data, one will be able to predict the value of the data at an intermediate point and by curve fitting, can find the most appropriate formula for a guessed relation of the data variables. This method of analysis data helps engineers to understand the system for better interpretation and decision making

- After studying this unit one will be able to find a root of a given equation and will be able to find a numerical solution for a given differential equation.
- Helps in describing the system by an ODE, if possible. Also, suggests to find the solution as a first approximation.
- One will be able to find the expansion of a given function by Fourier series and Fourier Transform of the function.
- Helps in phase transformation, Phase change and attenuation of coefficients in acoustics.

- After studying this unit, one will be able to find a corresponding Partial Differential Equation for an unknown function with many independent variables and to find their solution.
- Most of the problems in physical and engineering applications, problems are highly non-linear and hence expressing them as PDEs'. Hence understanding the nature of the equation and finding a suitable solution is very much essential.
- After studying this unit, one will be able to evaluate multiple integrals (line, surface, volume integrals) and convert line integrals to area integrals and surface integrals to volume integrals.
- It is an essential requirement for an engineer to understand the behavior of the physical system.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****3 -/- 6****(A10004) ENGINEERING PHYSICS****Objectives:**

It gives

- to the students basic understanding of bonding in solids, crystal structures and techniques to characterize crystals.
- to understand the behavior of electron in a solid and thereby one can determine the conductivity and specific heat values of the solids.
- to study applications in Engineering like memory devices, transformer core and Electromagnetic machinery.
- to help the student to design powerful light sources for various Engineering Applications and also enable them to develop communication systems using Fiber Technology.
- to understand the working of Electronic devices, how to design acoustic proof halls and understand the behavior of the materials at Nano scale.

**UNIT-I**

**Crystallography:** Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander-Waal's Bond, Calculation of Cohesive Energy of diatomic molecule-Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Structure of Diamond and NaCl.

**X-ray Diffraction & Defects in Crystals:** Bragg's Law, X-Ray diffraction methods: Laue Method, Powder Method: Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects, line defects (Qualitative) & Burger's Vector.

**UNIT-II**

**Principles of Quantum Mechanics:** Waves and Particles, de Broglie Hypothesis, Matter Waves, Davisson and Germer's Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function – Infinite square well potential, extension to three dimensions

**Elements of Statistical Mechanics & Electron theory of Solids:** Phase space, Ensembles, Micro Canonical, Canonical and Grand Canonical Ensembles - Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics (Qualitative Treatment), Concept of Electron Gas, Density of States, Fermi



Energy- Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), E-K curve, Origin of Energy Band Formation in Solids, Concept of Effective Mass of an Electron, Classification of Materials into Conductors, Semi Conductors & Insulators.

### UNIT-III

**Dielectric Properties:** Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities: Ionic and Electronic - Internal Fields in Solids, Clausius - Mossotti Equation, Piezo - electricity and Ferro- electricity.

**Magnetic Properties & Superconducting Properties:** Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials and their Applications, Superconductivity, Meissner Effect, Effect of Magnetic field, Type-I & Type-II Superconductors, Applications of Superconductors.

### UNIT-IV

**Optics:** Interference-Interference in thin films (Reflected light), Newton rings experiment- Fraunhofer diffraction due to single slit, N-slits, Diffraction grating experiment , Double refraction-construction and working of Nicol's Prism.

**Lasers & Fiber Optics:** Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and Relation between them, Population Inversion, Lasing Action, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers- Principle of Optical Fiber, Construction of fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers: Step Index and Graded Index Fibers, Attenuation in Optical Fibers, Application of Optical Fiber in communication systems.

### UNIT-V:

**Semiconductor Physics:** Fermi Level in Intrinsic and Extrinsic Semiconductors, Calculation of carrier concentration in Intrinsic &, Extrinsic Semiconductors, Direct and Indirect Band gap semiconductors, Hall Effect-Formation of PN Junction, Open Circuit PN Junction, Energy Diagram of PN Diode, Diode Equation, I-V Characteristics of PN Junction diode, Solar cell, LED & Photo Diodes. Acoustics of Buildings & Acoustic Quieting: Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time, Measurement of Absorption Coefficient of a Material, factors affecting the Architectural Acoustics and their Remedies.

**Nanotechnology:** Origin of Nanotechnology, Nano Scale, Surface to Volume

Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Top-down Fabrication: Chemical Vapour Deposition, Characterization by TEM.

**TEXT BOOKS:**

1. Engineering Physics, K. Malik, A. K. Singh, Tata Mc Graw Hill Book Publishers.
2. Engineering Physics, V. Rajendran, Tata Mc Graw Hill Book Publishers.

**REFERENCES:**

1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons.
2. Sears and Zemansky's University Physics (10<sup>th</sup> Edition) by Hugh D. Young Roger A. Freedman, T. R. Sandin, A. Lewis Ford Addison-Wesley Publishers.
3. Applied Physics for Engineers – P. Madhusudana Rao (Academic Publishing company, 2013).
4. Solid State Physics – M. Arumugam (Anuradha Publications).
5. Modern Physics – R. Murugesan & K. Siva Prasath – S. Chand & Co. (for Statistical Mechanics).
6. A Text Book of Engg Physics – M. N. Avadhanulu & P. G. Khsirsagar – S. Chand & Co. (for acoustics).
7. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co. Ltd.
8. Nanotechnology – M. Ratner & D. Ratner (Pearson Ed.).
9. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
10. Solid State Physics – A.J. Dekker (Macmillan).
11. Applied Physics – Mani Naidu Pearson Education.

**Outcomes:**

- The student would be able to learn the fundamental concepts on behavior of crystalline solids.
- The knowledge on Fundamentals of Quantum Mechanics, Statistical Mechanics enables the student to apply to various systems like Communications Solar Cells, Photo Cells and so on.
- Design, Characterization and study of properties of materials help the student to prepare new materials for various Engineering applications.
- This course also helps the student exposed to non-destructive testing methods.
- Finally, Engineering Physics Course helps the student to develop problem solving skills and analytical skills.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****3 -/- 6****(A10005) ENGINEERING CHEMISTRY****Objective:**

An engineer is as someone who uses scientific, natural and physical principles to design something of use for people or other living creatures. Much of what any engineer does involves chemistry because everything in our environment has a molecular make up. Engineering requires the concepts of applied chemistry and the more chemistry an engineer understands, the more beneficial it is. In the future, global problems and issues will require an in-depth understanding of chemistry to have a global solution. This syllabus aims at bridging the concepts and theory of chemistry with examples from fields of practical application, thus reinforcing the connection between science and engineering. It deals with the basic principles of various branches of chemistry which are fundamental tools necessary for an accomplished engineer.

**UNIT I:**

**Electrochemistry & Corrosion:** Electro Chemistry – Conductance - Specific, Equivalent and Molar conductance and their Units; Applications of Conductance (Conductometric titrations). **EMF:** Galvanic Cells, types of Electrodes – (Calomel, Quinhydrone and glass electrodes); Nernst equation and its applications ; concept of concentration cells, electro chemical series, Potentiometric titrations, determination of  $P^H$  using glass electrode-Numerical problems.

**Batteries:** Primary cells (dry cells) and secondary cells (lead-Acid cell, Ni-Cd cell, Lithium cells). Applications of batteries. **Fuel cells** – Hydrogen – Oxygen fuel cell; methanol – oxygen fuel cell ; Advantages and Applications.

**Corrosion and its control:** Causes and effects of corrosion; Theories of corrosion – Chemical & Electrochemical corrosion; Types of corrosion (Galvanic, Water line, Pitting and Intergranular); Factors affecting rate of corrosion – Nature of metal and Nature of Environment – Corrosion control methods – Cathodic protection (sacrificial anodic and impressed current). Surface coatings: Metallic coatings & methods of application of metallic coatings - hot dipping (galvanization & tinning), Cementation, cladding, electroplating (copper plating ) Electroless plating (Ni plating) - Organic coatings – Paints - constituents and their functions.

**UNIT II:**

**Engineering Materials: Polymers:** Types of Polymerization (Chain & Step growth). **Plastics:** Thermoplastic & Thermo setting resins; Compounding &

fabrication of plastics (Compression and injection moulding). Preparation, properties, engineering applications of PVC, Teflon and Bakelite.

**Fibers**- Characteristics of fibers – preparation, properties and uses of Nylon – 6,6 and Dacron – Fiber Reinforced Plastics (FRP) – applications. **Rubbers** – Natural rubber and its vulcanization. Elastomers – Buna-s, Butyl rubber and Thiokol rubber.

**Conducting polymers**: Polyacetylene, Polyaniline, Mechanism of Conduction, doping; applications of Conducting polymers. **Bio-degradable Polymers**- preparation and Applications of Poly vinyl acetate and Poly lactic acid - **Cement**: composition of Portland cement, setting & hardening of cement (reactions), **Lubricants**: Classification with examples- Characteristics of a good lubricant & mechanism of lubrication (thick film, thin film and extreme pressure) – properties of lubricants: viscosity, Cloud point, flash and fire points. **Refractories**: Classification, characteristics of a good refractory and applications.

**Nanomaterials**: Introduction, preparation by sol-gel & chemical vapour deposition methods. Applications of nanomaterials.

#### UNIT III:

**Water and its Treatment**: Hardness of Water: Causes of hardness, expression of hardness – units – types of hardness, estimation of temporary & permanent hardness of water by EDTA method - numerical problems. Boiler troubles – Scale & sludges, Priming and foaming, caustic embrittlement and boiler corrosion; Treatment of boiler feed water – Internal treatment (Phosphate, Colloidal and calgon conditioning) – External treatment – Lime Soda process, Zeolite process and ion exchange process. Numerical Problems. **Potable Water**- Its Specifications – Steps involved in treatment of potable water – Disinfection of water by chlorination and ozonisation. Reverse osmosis & its significance.

#### Unit – IV :

**Fuels & Combustion: Fuels** – Classification – solid fuels : coal – analysis of coal - proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining – cracking – types – fixed bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol, Bergius and Fischer-Tropsch's process: Gaseous fuels - constituents, characteristics and applications of natural gas, LPG and CNG. Analysis of flue gas by Orsat's apparatus – Numerical Problems.

**Combustion** – Definition, Calorific value of fuel – HCV , LCV; Determination of calorific value by Junker's gas calorimeter – theoretical calculation of Calorific value by Dulong's formula – Numerical problems on combustion.

#### UNIT V:

**Phase Rule & Surface Chemistry : Phase Rule**: Definition of terms: Phase,

component, degree of freedom, phase rule equation. Phase diagrams – one component system- water system. Two component system Lead- Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization.

**Surface Chemistry: Adsorption** – Types of Adsorption, Isotherms – Freundlich and Langmuir adsorption isotherm, applications of adsorption; **Colloids**: Classification of Colloids; Electrical & optical properties, micelles, applications of colloids in industry.

#### TEXT BOOKS:

1. Engineering Chemistry by R.P. Mani, K.N. Mishra, B. Rama Devi / CENGAGE learning.
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).

#### REFERENCE BOOKS

1. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited, New Delhi (2006).
2. Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills Publishing Company Limited, New Delhi (2004).
3. Text Book of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co Publishers, New Delhi (2006).
4. Chemistry of Engineering Materials by CV Agarwal, C.P Murthy, A.Naidu, BS Publications.

#### Outcome:

- Students will demonstrate a depth of knowledge and apply the methods of inquiry in a discipline of their choosing, and they will demonstrate a breadth of knowledge across their choice of varied disciplines.
- Students will demonstrate the ability to access and interpret information, respond and adapt to changing situations, make complex decisions, solve problems, and evaluate actions.
- Students will demonstrate awareness and understanding of the skills necessary to live and work in a diverse engineering world.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****3 -/- 6****(A10501) COMPUTER PROGRAMMING****Objectives:**

- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures such as lists, stacks and queues.
- To make the student understand simple sorting and searching methods.

**UNIT - I**

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements (making decisions) – if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Program examples.

**UNIT - II**

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes- auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs, Preprocessor commands.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

**UNIT - III**

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function,

memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

#### **UNIT - IV**

Enumerated, Structure, and Union Types– The Type Definition (typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples, command –line arguments.

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions, C program examples.

#### **UNIT – V**

Searching and Sorting – Sorting- selection sort, bubble sort, Searching-linear and binary search methods.

Lists- Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Push and Pop Operations, Queues- Enqueue and Dequeue operations.

#### **TEXT BOOKS:**

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.

#### **REFERENCE BOOKS:**

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. C for All, S. Thamarai Selvi, R.Murugesan, Anuradha Publications.
3. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7<sup>th</sup> Edition, Pearson education.
4. Programming in C, Ajay Mittal, Pearson.
5. Programming with C, B.Gottfried, 3<sup>rd</sup> edition, Schaum's outlines, TMH.
6. Problem solving with C, M.T.Somasekhara, PHI
7. Programming with C, R.S.Bickar, Universities Press.
8. Computer Programming & Data Structures, E.Balagurusamy, 4<sup>th</sup> edition, TMH.

9. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
10. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
11. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.

**Outcomes:**

Demonstrate the basic knowledge of computer hardware and software.

Ability to apply solving and logical skills to programming in C language and also in other languages.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****2 -/13 6****(A10301) ENGINEERING DRAWING****UNIT – I**

**Introduction to Engineering Drawing:** Principles of Engineering Drawing/ Graphics – Various Drawing Instruments – Conventions in Drawing – **Lettering practice** – BIS Conventions.

**Curves:** Constructions of Curves used in Engineering Practice:

- Conic Sections including the Rectangular Hyperbola – General method only.
- Cycloid, Epicycloid and Hypocycloid.
- Involute.

**Scales:** Construction of different types of Scales, Plain, Diagonal, Vernier scale.

**UNIT – II****Orthographic Projections in First Angle**

**Projection:** Principles of Orthographic Projections – Conventions – First and Third Angle projections.

**Projections of Points :** including Points in all four quadrants.

**Projections of Lines :** Parallel, perpendicular, inclined to one plane and inclined to both planes. True length and true angle of a line. Traces of a line.

**Projections of Planes:** Plane parallel, perpendicular and inclined to one reference plane. Plane inclined to both the reference planes.

**UNIT – III**

**Projections of Solids:** Projections of regular solids, cube, prisms, pyramids, tetrahedron, cylinder and cone, axis inclined to both planes.

**Sections and Sectional Views:** Right Regular Solids – Prism, Cylinder, Pyramid, Cone – use of Auxiliary views.

**UNIT – IV**

**Development of Surfaces:** Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramids, Cone and their parts. frustum of solids.

**Intersection of Solids:-** Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

**UNIT – V**

**Isometric Projections :** Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Plane Figures, Simple and Compound

Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of parts with Spherical surface.

**Transformation of Projections** : Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.

**Perspective Projections** : Perspective View : Points, Lines and Plane Figures, Vanishing Point Methods (General Method only).

#### **TEXT BOOKS**

1. Engineering Drawing – Basant, Agrawal, TMH
2. Engineering Drawing, N.D. Bhatt

#### **REFERENCES :**

1. Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd.
2. Engineering drawing – P.J. Shah .S.Chand Publishers.
3. Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers.
4. Engineering Drawing – M.B. Shah and B.C. Rana, Pearson.
5. Engineering Drawing by K.Venu Gopal & V.Prabu Raja New Age Publications.
6. Engineering Drawing by John. PHI Learning Publisher.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****- -/3/- 4****(A10581) COMPUTER PROGRAMMING LAB****Objectives:**

- To write programs in C to solve the problems.
- To implement linear data structures such as lists, stacks, queues.
- To implement simple searching and sorting methods.

**Recommended Systems/Software Requirements:**

- Intel based desktop PC
- ANSI C Compiler with Supporting Editors

**Week 1**

- a) Write a C program to find the sum of individual digits of a positive integer.
- b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

**Week 2**

- a) Write a C program to calculate the following Sum:  

$$\text{Sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$
- b) Write a C program to find the roots of a quadratic equation.

**Week 3**

- a) The total distance travelled by vehicle in 't' seconds is given by distance  $s = ut + \frac{1}{2}at^2$  where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec<sup>2</sup>). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
- b) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)

**Week 4**

- a) Write C programs that use both recursive and non-recursive functions
- To find the factorial of a given integer.

- ii) To find the GCD (greatest common divisor) of two given integers.

**Week 5**

- a) Write a C program to find the largest integer in a list of integers.
- b) Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

**Week 6**

- a) Write a C program that uses functions to perform the following operations:
  - i) To insert a sub-string in to a given main string from a given position.
  - ii) To delete n Characters from a given position in a given string.
- b) Write a C program to determine if the given string is a palindrome or not

**Week 7**

- a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
- b) Write a C program to count the lines, words and characters in a given text.

**Week 8**

- a) Write a C program to generate Pascal's triangle.
- b) Write a C program to construct a pyramid of numbers.

**Week 9**

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$$1+x+x^2+x^3+\dots\dots\dots+x^n$$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if  $n < 0$ , then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

**Week 10**

- a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
- b) Write a C program to convert a Roman numeral to its decimal equivalent.

**Week 11**

Write a C program that uses functions to perform the following operations:

- i) Reading a complex number
- ii) Writing a complex number
- iii) Addition of two complex numbers
- iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

**Week 12**

a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

**Week 13**

a) Write a C program to display the contents of a file.

b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

**Week 14**

a) Write a C program that uses non recursive function to search for a Key value in a given list of integers using Linear search.

b) Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using Binary search.

**Week 15**

a) Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.

b) Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

**Week 16**

Write a C program that uses functions to perform the following operations:

- i) Create a singly linked list of integer elements.
- ii) Traverse, the above list and display the elements.

**Week 17**

Write a C program that implements stack (its operations) using a singly linked list to display a given list of integers in reverse order. Ex. input: 10 23 4 6 output: 6 4 23 10

**Week 18**

Write a C program that implements Queue (its operations) using a singly linked list to display a given list of integers in the same order. Ex. input: 10

23 4 6 output: 10 23 4 6

**Week 19**

Write a C program to implement the linear regression algorithm.

**Week 20**

Write a C program to implement the polynomial regression algorithm.

**Week 21**

Write a C program to implement the Lagrange interpolation.

**Week 22**

Write C program to implement the Newton- Gregory forward interpolation.

**Week 23**

Write a C program to implement Trapezoidal method.

**Week 24**

Write a C program to implement Simpson method.

**TEXT BOOKS:**

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications.
2. Computer Programming in C, V. Rajaraman, PHI Publishers.
3. C Programming, E.Balagurusamy, 3<sup>rd</sup> edition, TMH Publishers.
4. C Programming, M.V.S.S.N.Prasad, ACME Learning Pvt. Ltd.
5. C and Data Structures, N.B.Venkateswarlu and E.V.Prasad,S.Chand Publishers
6. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****- -/3/- 4****(A10081) ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB****ENGINEERING PHYSICS LAB****(Any TEN experiments compulsory)****Objectives**

This course on Physics lab is designed with 13 experiments in an academic year. It is common to all branches of Engineering in B.Tech I<sup>st</sup> year.

The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student.

The experiments are selected from various areas of Physics like Physical Optics, Lasers, Fiber Optics, Sound, Mechanics, Electricity & Magnetism and Basic Electronics.

Also the student is exposed to various tools like Screw gauge, Vernier Callipers, Physics Balance, Spectrometer and Microscope.

1. Dispersive power of the material of a prism – Spectrometer
2. Determination of wavelength of a source – Diffraction Grating.
3. Newton's Rings - Radius of curvature of plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Time constant of an R-C circuit.
6. L-C-R circuit.
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method.
8. Study the characteristics of LED and LASER sources.
9. Bending losses of fibres & Evaluation of numerical aperture of a given fibre.
10. Energy gap of a material of p-n junction.
11. Torsional pendulum.
12. Wavelength of light –diffraction grating - using laser.
13. Characteristics of a solar cell

**LABORATORY MANUAL:**

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.Venkateswara Rao (V.G.S Publishers)

**Outcomes**

The student is expected to learn from this laboratory course the concept of error and its analysis. It also allows the student to develop experimental skills to design new experiments in Engineering.

With the exposure to these experiments the student can compare the theory and correlate with experiment.

**ENGINEERING CHEMISTRY LAB**

List of Experiments ( Any 12 of the following)

**Titrimetry:**

1. Estimation of ferrous iron by dichrometry.
2. Estimation of hardness of water by EDTA method.

**Mineral analysis:**

3. Determination of percentage of copper in brass.
4. Estimation of manganese dioxide in pyrolusite.

**Instrumental Methods:****Colorimetry:**

5. Determination of ferrous iron in cement by colorimetric method
6. Estimation of copper by colorimetric method.

**Conductometry:**

7. Conductometric titration of strong acid vs strong base.
8. Conductometric titration of mixture of acids vs strong base.

**Potentiometry:**

9. Titration of strong acid vs strong base by potentiometry.
10. Titration of weak acid vs strong base by potentiometry.

**Physical properties:**

11. Determination of viscosity of sample oil by redwood / oswald's viscometer.
12. Determination of Surface tension of lubricants.

**Preparations:**

13. Preparation of Aspirin
14. Preparation of Thiokol rubber

**Adsorption:**

15. Adsorption of acetic acid on charcoal.



**TEXT BOOKS:**

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Inorganic quantitative analysis, Vogel.

**REFERENCE BOOKS:**

1. Text Book of engineering chemistry by R. N. Goyal and Harmendra Goel, Ane Books Private Ltd.,
2. A text book on experiments and calculation Engg. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****- -/3/- 4****(A10083) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB**

The **Language Lab** focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

**Objectives**

- ✂ To facilitate computer-aided multi-media instruction enabling individualized and independent language learning.
- ✂ To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm.
- ✂ To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.
- ✂ To improve the fluency in spoken English and neutralize mother tongue influence.
- ✂ To train students to use language appropriately for interviews, group discussion and public speaking.

**Syllabus: English Language Communication Skills Lab shall have two parts:**

- a. Computer Assisted Language Learning (CALL) Lab**
- b. Interactive Communication Skills (ICS) Lab**

The following course content is prescribed for the **English Language Communication Skills Lab**.

**Exercise – I**

**CALL Lab:** Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

**ICS Lab:** Ice-Breaking activity and JAM session.

Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms.

**Exercise – II**

**CALL Lab:** Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.

**ICS Lab:** Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies –

Requests – Social and Professional Etiquette - Telephone Etiquette.

Concord (Subject in agreement with verb) and Words often misspelt-confused/misused

### **Exercise - III**

**CALL Lab:** Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.

**ICS Lab:** Descriptions- Narrations- Giving Directions and guidelines.

Sequence of Tenses, Question Tags and One word substitutes.

### **Exercise – IV**

**CALL Lab:** Intonation and Common errors in Pronunciation.

**ICS Lab:** Extempore- Public Speaking

Active and Passive Voice, –Common Errors in English, Idioms and Phrases

### **Exercise – V**

**CALL Lab:** Neutralization of Mother Tongue Influence and Conversation Practice

**ICS Lab:** Information Transfer- Oral Presentation Skills

Reading Comprehension and Job Application with Resume preparation.

### **Minimum Requirement of infra structural facilities for ELCS Lab:**

#### **1. Computer Assisted Language Learning (CALL) Lab:**

**The Computer aided Language Lab** for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

#### **System Requirement (Hardware component):**

*Computer network with Lan with minimum 60 multimedia systems with the following specifications:*

- (i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- (ii) Headphones of High quality

#### **2. Interactive Communication Skills (ICS) Lab :**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

### **Books Suggested for English Language Lab Library (to be located within**

the lab in addition to the CDs of the text book which are loaded on the systems):

1. Suresh Kumar, E. & Sreehari, P. 2009. *A Handbook for English Language Laboratories*. New Delhi: Foundation
2. *Speaking English Effectively* 2<sup>nd</sup> Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V & Dhamija, P.V. *How to Prepare for Group Discussion and Interviews*. Tata McGraw Hill
4. Hancock, M. 2009. *English Pronunciation in Use. Intermediate*. Cambridge: CUP
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. Hewings, M. 2009. *English Pronunciation in Use. Advanced*. Cambridge: CUP
7. Marks, J. 2009. *English Pronunciation in Use. Elementary*. Cambridge: CUP
8. Nambiar, K.C. 2011. *Speaking Accurately. A Course in International Communication*. New Delhi : Foundation
9. Soundararaj, Francis. 2012. *Basics of Communication in English*. New Delhi: Macmillan
10. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
11. **English Pronouncing Dictionary** Daniel Jones Current Edition with CD.
12. **A textbook of English Phonetics for Indian Students** by T. Balasubramanian (Macmillan)
13. **Prescribed Lab Manual:** A Manual entitled “**English Language Communication Skills (ELCS) Lab Manual- cum- Work Book**”, published by Cengage Learning India Pvt. Ltd, New Delhi. 2013

#### **DISTRIBUTION AND WEIGHTAGE OF MARKS**

##### **English Language Laboratory Practical Examination:**

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s).

The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

**Outcomes:**

- Better Understanding of nuances of language through audio- visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking with clarity and confidence thereby enhancing employability skills of the students

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****I Year B.Tech. ECE****L T/P/D C****- -/3/- 4****(A10082) IT WORKSHOP / ENGINEERING WORKSHOP****Objectives:**

The IT Workshop for engineers is a training lab course spread over 54 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel and Power Point.

**PC Hardware** introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.**

**Internet & World Wide Web** module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

**Productivity tools** module would enable the students in crafting professional word documents, excel spread sheets and power point presentations using the Microsoft suite of office tools and LaTeX. **(Recommended to use Microsoft office 2007 in place of MS Office 2003)**

**PC Hardware**

**Week 1 – Task 1 :** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Week 2 – Task 2 :** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Week 3 – Task 3 :** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Week 4 – Task 4 :** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Week 5 – Task 5: Hardware Troubleshooting:** Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

**Week 6 – Task 6 : Software Troubleshooting :** Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

#### **Internet & World Wide Web**

**Week 7 - Task 1 : Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Week 8 - Task 2 : Web Browsers, Surfing the Web :** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Week 9 - Task 3 : Search Engines & Netiquette :** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Week 10 - Task 4: Cyber Hygiene:** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**Week 11- Task 5:** Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

**Productivity tools****LaTeX and Word**

**Week 12 – Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

**Task 1 : Using LaTeX and Word** to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

**Week 13 - Task 2: Creating project abstract** Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Week 14 - Task 3 : Creating a Newsletter** : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

**Excel**

**Week 15 - Excel Orientation:** The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1: Creating a Scheduler** - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Week 16 - Task 2 : Calculating GPA** - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

**LaTeX and MS/equivalent (FOSS) tool Power Point**

**Week 17 - Task1:** Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point. Students will be given model power



point presentation which needs to be replicated (exactly how it's asked).

**Week 18- Task 2:** Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts

**Week 19 - Task 3:** Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

#### REFERENCE BOOKS:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. LaTeX Companion – Leslie Lamport, PHI/Pearson.
3. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill Publishers.
4. Upgrading and Repairing, PC's 18<sup>th</sup> e, Scott Muller QUE, Pearson Education
5. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft)

#### Outcomes:

- Apply knowledge for computer assembling and software installation.
- Ability how to solve the trouble shooting problems.
- Apply the tools for preparation of PPT, Documentation and budget sheet etc.

### ENGINEERING WORKSHOP

#### 1. TRADES FOR EXERCISES:

**At least two exercises from each trade:**

1. Carpentry
2. Fitting
3. Tin-Smithy and Development of jobs carried out and soldering.

4. Black Smithy
5. House-wiring
6. Foundry
7. Welding
8. Power tools in construction, wood working, electrical engineering and mechanical Engineering.

**2. TRADES FOR DEMONSTRATION & EXPOSURE:**

1. Plumbing
2. Machine Shop
3. Metal Cutting (Water Plasma)

**TEXT BOOK:**

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2. Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A30007) MATHEMATICS – III****Objectives:** To learn

- Transforming the given variable coefficient equation (Cauchy's and Lagrange's) into the one with constant coefficients.
- Identifying ordinary points, singular points and regular singular points for the given ODE.
- Finding the series solution around a regular singular point.
- Solve the given ODE with variable coefficients by Frobenius method and test the convergence of its series solution.
- Series solutions for Legendre and Bessel differential equations, analyzing the properties of Legendre and Bessel polynomials.
- Differentiation and Integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula.
- Taylor's series, Maclaurin's series and Laurent's series expansions of complex functions
- Evaluation of integrals using residue theorem.
- Transform a given function from  $z$  - plane to  $w$  - plane.
- Identify the transformations like translation, magnification, rotation and reflection and inversion.
- Properties of bilinear transformations.

**UNIT – I:**

**Linear ODE with variable coefficients and series solutions(second order only):** Equations reducible to constant coefficients-Cauchy's and Lagrange's differential equations. Motivation for series solutions, Ordinary point and Regular singular point of a differential equation, Transformation of non-zero singular point to zero singular point. Series solutions to differential equations around zero, Frobenius Method about zero.

**Unit-II**

**Special Functions :** Legendre's Differential equation, General solution of Legendre's equation, Legendre polynomials Properties: Rodrigue's formula – Recurrence relations, Generating function of Legendre's polynomials – Orthogonality. Bessel's Differential equation, Bessel functions properties: – Recurrence relations, Orthogonality, Generating function, Trigonometric expansions involving Bessel functions.

**UNIT-III:**

**Complex Functions –Differentiation and Integration :** Complex functions and its representation on Argand plane, Concepts of limit Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions – Milne – Thompson method. Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

**UNIT-IV:**

**Power series expansions of complex functions and contour Integration:** Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity. Residue – Evaluation of residue by formula and by Laurent series – Residue theorem. Evaluation of integrals of the type

(a) Improper real integrals  $\int_{-\infty}^{\infty} f(x)dx$

(b)  $\int_c^{c+2\pi} f(\cos \theta, \sin \theta)d\theta$

**UNIT-V:**

**Conformal mapping:** Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection, Transformations like  $e^z$ ,  $\log z$ ,  $z^2$ , and Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given .

**TEXT BOOKS:**

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

**REFERENCES:**

- 1) Complex Variables Principles and Problem Sessions By A.K.Kapoor, World Scientific Publishers.
- 2) Engineering Mathematics-3 by T.K.V.Iyengar and B.Krishna Gandhi Etc.
- 3) A Text Book of Engineering Mathematics by N P Bali, Manesh Goyal.
- 4) Mathematics for Engineers and Scientists, Alan Jeffrey, 6<sup>th</sup> Edit. 2013, Chapman & Hall/CRC.

- 5) Advanced Engineering Mathematics, Michael Greenberg, Second Edition, Pearson Education.
- 6) Mathematics For Engineers by K.B.Datta and M.A S.Srinivas, Cengage Publications.

**Outcome:** After going through this course the student will be able to:

- Apply the Frobenius method to obtain a series solution for the given linear 2<sup>nd</sup> ODE.
- Identify Bessel equation and Legendre equation and solve them under special conditions with the help of series solutions method. Also recurrence relations and orthogonality properties of Bessel and Legendre polynomials.

After going through this course the student will be able to

- a. analyze the complex functions with reference to their analyticity, Integration using Cauchy's integral theorem,
- b. Find the Taylor's and Laurent series expansion of complex functions
- c. The conformal transformations of complex functions can be dealt with ease.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-I Sem****L T/P/D C****4 - 4****(A30405) PROBABILITY THEORY AND STOCHASTIC PROCESSES****Objectives:**

The primary objective of this course is:

- To provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in signal processing and Communication Engineering.
- To introduce students to the basic methodology of “probabilistic thinking” and to apply it to problems;
- To understand basic concepts of probability theory and random variables, how to deal with multiple random variables, Conditional probability and conditional expectation, joint distribution and independence, mean square estimation.
- To understand the difference between time averages and statistical averages
- Analysis of random process and application to the signal processing in the communication system.
- To teach students how to apply sums and integrals to compute probabilities, means, and expectations.

**UNIT-I:****Probability and Random Variable**

**Probability:** Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events.

**Random Variable:** Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables

**UNIT -II:****Distribution & Density Functions and Operation on One Random Variable – Expectations**

**Distribution & Density Functions:** Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event,

Conditional Density, Properties.

**Operation on One Random Variable – Expectations:** Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

#### **UNIT-III:**

##### **Multiple Random Variables and Operations**

**Multiple Random Variables:** Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

**Operations on Multiple Random Variables:** Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

#### **UNIT-IV:**

**Stochastic Processes – Temporal Characteristics:** The Stochastic Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, Nth Order and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties, Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions, Gaussian Random Processes, Poisson Random Process.

#### **UNIT-V:**

**Stochastic Processes – Spectral Characteristics:** Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Spectral Density of Input and Output of a Linear System.

**TEXT BOOKS:**

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, 4Ed., 2001, TMH.
2. Probability and Random Processes – Scott Miller, Donald Childers, 2 Ed, Elsevier, 2012.

**REFERENCE BOOKS:**

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, 4 Ed., TMH.
2. Theory of Probability and Stochastic Processes- Pradip Kumar Gosh, University Press
3. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, 3 Ed., PE
4. Probability Methods of Signal and System Analysis - George R. Cooper, Clave D. MC Gillem, 3 Ed., 1999, Oxford.
5. Statistical Theory of Communication - S.P. Eugene Xavier, 1997, New Age Publications.

**Outcomes:**

Upon completion of the subject, students will be able to compute:

- Simple probabilities using an appropriate sample space.
- Simple probabilities and expectations from probability density functions (pdfs)
- Likelihood ratio tests from pdfs for statistical engineering problems.
- Least -square & maximum likelihood estimators for engineering problems.
- Mean and covariance functions for simple random processes.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A30407) SWITCHING THEORY AND LOGIC DESIGN****Course Objectives:**

This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
- To implement synchronous state machines using flip-flops.

**UNIT -I:**

**Number System and Boolean Algebra And Switching Functions:** Number Systems, Base Conversion Methods, Complements of Numbers, Codes-Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.

**Boolean Algebra:** Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

**UNIT -II:**

**Minimization and Design of Combinational Circuits:** Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method, Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

**UNIT -III:**

**Sequential Machines Fundamentals:** Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch Flip-Flop, The "Clocked T" Flip-Flop, The "Clocked J-K" Flip-Flop, Design of a Clocked Flip-Flop, Conversion from one type of Flip-Flop to another, Timing and Triggering Consideration, Clock Skew.

**UNIT -IV:**

**Sequential Circuit Design and Analysis:** Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization using Flip-Flops

Counters - Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register.

**UNIT -V:**

**Sequential Circuits:** Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

Algorithmic State Machines: Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

**TEXT BOOKS:**

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge.
2. Digital Design- Morris Mano, PHI, 3rd Edition.

**REFERENCE BOOKS:**

1. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
2. Digital Fundamentals – A Systems Approach – Thomas L. Floyd, Pearson, 2013.
3. Digital Logic Design - Ye Brian and HoldsWorth, Elsevier
4. Fundamentals of Logic Design- Charles H. Roth, Cengage LEarning, 5th, Edition, 2004.
5. Digital Logic Applications and Design- John M. Yarbrough, Thomson Publications, 2006.
6. Digital Logic and State Machine Design – Comer, 3rd, Oxford, 2013.

**Course Outcomes:**

Upon completion of the course, students should possess the following skills:

- Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
- Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
- Be able to design and analyse small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
- Be able to design and analyse small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A30204) ELECTRICAL CIRCUITS****Objective:**

This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, theorems and network topology.

**UNIT –I:**

**Introduction to Electrical Circuits:** Circuit Concept, R-L-C Parameters, Voltage and Current Sources, Independent and Dependent Sources, Source Transformation, Voltage – Current relationship for Passive Elements (for different input signals –Square, Ramp, Saw tooth and Triangular). Kirchhoff's Laws, Network Reduction Techniques – Series, Parallel, Series Parallel, Star –to-Delta or Delta-to-Star Transformations, Nodal Analysis, Mesh Analysis, Super node and Super mesh for DC Excitations.

**UNIT –II:**

**Single Phase A.C. Circuits:** R.M.S. and Average values and form factor for different periodic wave forms, Steady State Analysis of R, L and C (in Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation, Concept of Reactance, Impedance, Susceptance and Admittance, Phase and Phase difference, Concept of Power Factor, Real and Reactive powers, J-notation, Complex and Polar forms of representation, Complex power.

**UNIT –III:**

**Locus diagrams, Resonance and Magnetic circuits:** Locus diagrams - series R-L, R-C, R-L-C and parallel combination with variation of various parameters - Resonance-series, parallel circuits, concept of band width and Q factor. Magnetic circuits-Faraday's laws of electromagnetic induction-concept of self and mutual inductance-dot convention-coefficient of coupling-composite magnetic circuit-analysis of series and parallel magnetic circuits.

**UNIT –IV:**

**Network Topology:** Definitions, Graph, Tree, Basic cutset and Basic Tie set Matrices for Planar Networks, Loop and Nodal methods for analysis of Networks with Dependent & Independent Voltage and Current Sources, Duality & Dual Networks.

**UNIT –V:**

**Network Theorems (With A.C. & D.C):** Tellegen's, Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's and

Compensation theorems for D.C excitations.

**TEXT BOOKS:**

1. Electric Circuits - A.Chakrabarhty, Dhanipat Rai & Sons.
2. Network analysis - N.C Jagan and C. Lakhminarayana, BS publications.

**REFERENCE BOOKS:**

1. Engineering Circuit Analysis - William Hayt ,Jack E. Kemmerly, S M Durbin, Mc Graw Hill Companies.
2. Electric Circuit Analysis - K.S.Suresh Kumar, Pearson Education.
3. Electrical Circuits - David A.Bell, Oxford University Press.
4. Network Analysis and Circuits - M.Arshad, Infinity Science Press.
5. Circuits - A.Bruce Carlson, Cengage Learning.
6. Electrical Circuits: An Introduction - KCA Smith & RE Alley, Cambridge University Press.

**Outcome:**

After going through this course the student gets a thorough knowledge on basics of circuit concepts, electrical parameters, single phase AC circuits, magnetic circuits , resonance, network topology and network theorems with which he/she can able to apply the above conceptual things to real-world problems and applications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A30404) ELECTRONIC DEVICES AND CIRCUITS****Objectives:**

This is a fundamental course, basic knowledge of which is required by all the circuit branch engineers. This course focuses:

- To familiarize the student with the principle of operation, analysis and design of Junction diode, BJT and FET transistors and amplifier circuits.
- To understand diode as rectifier.
- To study basic principle of filter circuits and various types.

**UNIT -I:**

**P-N Junction Diode:** Qualitative Theory of P-N Junction, P-N Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of VI characteristic, Ideal versus Practical – Resistance levels (Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis, Breakdown Mechanisms in Semiconductor Diodes, Zener Diode Characteristics.

**Special Purpose Electronic Devices:** Principle of Operation and Characteristics of Tunnel Diode (with the help of Energy Band Diagram), Varactor Diode, SCR and Semiconductor Photo Diode.

**UNIT-II:**

**Rectifiers and Filters :** The P-N junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L- Section Filters, p- Section Filters, Comparison of Filters, Voltage Regulation using Zener Diode.

**UNIT-III:**

**Bipolar Junction Transistor and UJT:** The Junction Transistor, Transistor Current Components, Transistor as an Amplifier, Transistor Construction, BJT Operation, BJT Symbol, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation , BJT Specifications, BJT Hybrid Model, Determination of h-parameters from Transistor Characteristics, Comparison of CB, CE, and CC Amplifier Configurations, UJT and Characteristics.

**UNIT-IV:**

**Transistor Biasing and Stabilization:** Operating Point, The DC and AC Load lines, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector - Emitter Feedback Bias, Voltage Divider Bias,

Bias Stability, Stabilization Factors, Stabilization against variations in  $V_{BE}$  and  $\beta$ , Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability, Analysis of a Transistor Amplifier Circuit using h-Parameters.

#### **UNIT-V:**

##### **Field Effect Transistor and FET Amplifiers**

**Field Effect Transistor:** The Junction Field Effect Transistor (Construction, principle of operation, symbol) – Pinch-off Voltage - Volt-Ampere characteristics, The JFET Small Signal Model, MOSFET (Construction, principle of operation, symbol), MOSFET Characteristics in Enhancement and Depletion modes.

**FET Amplifiers:** FET Common Source Amplifier, Common Drain Amplifier, Generalized FET Amplifier, Biasing FET, FET as Voltage Variable Resistor, Comparison of BJT and FET.

#### **TEXT BOOKS:**

1. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 2 Ed.,1998, TMH.
2. Electronic Devices and Circuits – Mohammad Rashid, Cengage Learning, 2013
3. Electronic Devices and Circuits – David A. Bell, 5 Ed, Oxford

#### **REFERENCE BOOKS:**

1. Integrated Electronics – J. Millman and Christos C. Halkias, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI.
3. Electronic Devices and Circuits – B. P. Singh, Rekha Singh, Pearson, 2Ed, 2013.
4. Electronic Devices and Circuits --K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal, 1 Ed., 2009, Wiley India Pvt. Ltd.
6. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, 2 Ed., 2008, TMH.

#### **Course Outcomes:**

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

- Understand and Analyse the different types of diodes, operation and its characteristics
- Design and analyse the DC bias circuitry of BJT and FET
- Design biasing circuits using diodes and transistors.
- To analyze and design diode application circuits, amplifier circuits and oscillatorsemploying BJT, FET devices.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A30406) SIGNALS AND SYSTEMS****Objectives:**

This is a core subject, basic knowledge of which is required by all the engineers.

This course focuses on:

- To get an in-depth knowledge about signals, systems and analysis of the same using various transforms.

**UNIT-I:****Signal Analysis and Fourier Series**

**Signal Analysis:** Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

**Fourier Series:** Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

**UNIT-II:****Fourier Transforms and Sampling**

**Fourier Transforms:** Deriving Fourier Transform from Fourier Series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

**Sampling:** Sampling theorem – Graphical and analytical proof for Band Limited Signals, Types of Sampling - Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass sampling.

**UNIT-III:**

**Signal Transmission Through Linear Systems:** Linear System, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and Rise time.



**UNIT-IV:**

**Convolution and Correlation of Signals:** Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms, Cross Correlation and Auto Correlation of functions, Properties of Correlation function, Energy density spectrum, Parseval's Theorem, Power density spectrum, Relation between Auto Correlation function and Energy/Power spectral density function, Relation between Convolution and Correlation, Detection of periodic signals in the presence of Noise by Correlation, Extraction of signal from noise by filtering.

**UNIT-V:****Laplace Transforms and Z-Transforms**

**Laplace Transforms:** Review of Laplace Transforms (L.T), Partial fraction expansion, Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Constraints on ROC for various classes of signals, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

**Z-Transforms:** Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal, Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

**TEXT BOOKS:**

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2 Ed., PHI.

**REFERENCE BOOKS:**

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2 Ed.
2. Signals and Systems – Iyer and K. Satya Prasad, Cengage Learning
3. Signals and Systems – A.Rama Krishna Rao – 2008, TMH.
4. Introduction to Signal and System Analysis – K.Gopalan 2009, Cengage Learning.
5. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
6. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE.

**Course Outcomes:**

Upon completing this course the student will be able to:

- Represent any arbitrary signals in terms of complete sets of orthogonal functions and understands the principles of impulse functions, step function and signum function.
- Express periodic signals in terms of Fourier series and express the spectrum and express the arbitrary signal (discrete) as Fourier transform to draw the spectrum.
- Understands the principle of linear system, filter characteristics of a system and its bandwidth, the concepts of auto correlation and cross correlation and power Density Spectrum.
- Can design a system for sampling a signal.
- For a given system, response can be obtained using Laplace transform, properties and ROC of L.T.
- Study the continuous and discrete signal relation and relation between F.T., L.T. & Z.T, properties, ROC of Z Transform.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-I Sem****L T/P/D C****- -/3/- 2****(A30482) ELECTRONIC DEVICES AND CIRCUITS LAB****PART A:** (Only for Viva-voce Examination)**Electronic Workshop Practice (In 3 Lab Sessions):**

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's
2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.
3. Study and operation of
  - i) Multimeters (Analog and Digital)
  - ii) Function Generator
  - iii) Regulated Power Supplies
  - iv) CRO.

**PART B: (For Laboratory Examination – Minimum of 10 experiments)**

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Input & Output Characteristics of Transistor in CB Configuration and h-parameter calculations.
4. Input & Output Characteristics of Transistor in CE Configuration and h-parameter calculations.
5. Half Wave Rectifier with & without filters.
6. Full Wave Rectifier with & without filters.
7. FET characteristics.
8. Design of Self-bias circuit.
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier .
12. SCR characteristics.
13. UJT Characteristics

**PART C: Equipment required for Laboratories:**

1. Regulated Power supplies (RPS) -0-30 V

- |    |                                   |   |
|----|-----------------------------------|---|
| 2. | CRO's -0-20 MHz.                  |   |
| 3. | Function Generators               | -0-1 MHz.   |
| 4. | Multimeters                       |   |
| 5. | Decade Resistance Boxes/Rheostats |   |
| 6. | Decade Capacitance Boxes          |   |
| 7. | Ammeters (Analog or Digital)      | -0-20 $\mu$ A, 0-50 $\mu$ A,<br>0-100 $\mu$ A, 0-200 $\mu$ A,<br>0-10 mA.   |
| 8. | Voltmeters (Analog or Digital)    | -0-50V, 0-100V,<br>0-250V   |
| 9. | Electronic Components             | -Resistors,<br>Capacitors, BJTs,<br>LCDs, SCRs, UJTs,<br>FETs, LEDs,<br>MOSFETs,<br>Diodes- Ge& Si type,<br>Transistors – NPN,<br>PNP type) |

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-I Sem****L T/P/D C****- -/3/- 2****(A30481) BASIC SIMULATION LAB**

Note:

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 15 experiment are to be completed

**List of Experiments:**

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution between Signals and sequences.
6. Auto Correlation and Cross Correlation between Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
9. Gibbs Phenomenon
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
13. Generation of Gaussian noise ( Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Sampling Theorem Verification.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process for Stationarity in Wide sense.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A40215) PRINCIPLES OF ELECTRICAL ENGINEERING****Objectives:**

This course introduces the basic concepts of transient analysis of the circuits, the basic two-port network parameters and the design analysis of filters and attenuators and their use in circuit theory. The emphasis of this course is laid on the basic operation of the DC machines and transformers which includes DC generators and motors, single-phase transformers.

**UNIT –I:**

**Transient Analysis (First and Second Order Circuits):** Transient Response of RL, RC Series, RLC Circuits for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.

**UNIT –II:**

**Two Port Networks:** Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameter to another, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems.

**UNIT –III:**

**Filters and Symmetrical Attenuators:** Classification of Filters, Filter Networks, Classification of Pass band and Stop band, Characteristic Impedance in the Pass and Stop Bands, Constant-k Low Pass Filter, High Pass Filter, m-derived T-Section, Band Pass filter and Band Elimination filter, Illustrative Problems. Symmetrical Attenuators – T-Type Attenuator, p-Type Attenuator, Bridged T type Attenuator, Lattice Attenuator.

**UNIT –IV:**

**DC Machines:** Principle of Operation of DC Machines, EMF equation, Types of Generators, Magnetization and Load Characteristics of DC Generators. DC Motors, Types of DC Motors, Characteristics of DC Motors, Losses and Efficiency, Swinburne's Test, Speed Control of DC Shunt Motor, Flux and Armature Voltage control methods.

**UNIT –V:**

**Transformers and Their Performance:** Principle of Operation of Single Phase transformer, Types, Constructional Features, Phasor Diagram on No Load and Load, Equivalent Circuit, Losses and Efficiency of Transformer and Regulation, OC and SC Tests ( Simple Problems). Synchros, Stepper Motors.

**TEXT BOOKS:**

1. Electric Circuits - A. Chakrabarhty, Dhanipat Rai & Sons.
2. Basic concepts of Electrical Engineering - PS Subramanyam, BS Publications

**REFERENCE BOOKS:**

1. Engineering circuit analysis - William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 7th Edition.
2. Basic Electrical Engineering - S.N. Singh, PHI.
3. Electrical Circuits - David A.Bell, Oxford University Press.
4. Electric Circuit Analysis - K.S.Suresh Kumar, Pearson Education.

**Outcome:**

After going through this course the student gets a thorough knowledge on transient analysis of circuits, filters, attenuators , the operation of DC machines and transformers, with which he/she can able to apply the above conceptual things to real-world problems and applications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A40412) ELECTRONIC CIRCUIT ANALYSIS****Course Objective:**

- To familiarize the student with the analysis and design of basic transistor amplifier circuits and their frequency response characteristics, feedback amplifiers, oscillators, large signal amplifiers and tuned amplifiers

**UNIT -I:****Single Stage and Multi Stage Amplifiers**

**Single Stage Amplifiers:** Classification of Amplifiers – Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified Hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller's Theorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.

**Multi Stage Amplifiers:** Analysis of Cascaded RC Coupled BJT amplifiers, Cascode Amplifier, Darlington Pair, Different Coupling Schemes used in Amplifiers - RC Coupled Amplifier, Transformer Coupled Amplifier, Direct Coupled Amplifier.

**UNIT –II:****BJT Amplifiers and MOS Amplifiers**

**BJT Amplifiers - Frequency Response:** Logarithms, Decibels, General frequency considerations, Frequency response of BJT Amplifier, Analysis at Low and High frequencies, Effect of coupling and bypass Capacitors, The Hybrid-  $\pi$  (p) - Common Emitter Transistor Model, CE Short Circuit Current Gain, Current Gain with Resistive Load, Single Stage CE Transistor Amplifier Response, Gain-Bandwidth Product, Emitter follower at higher frequencies.

**MOS Amplifiers [3]:** Basic concepts, MOS Small signal model, Common source amplifier with Resistive load.

**UNIT –III:****Feedback Amplifiers and Oscillators**

**Feedback Amplifiers:** Concepts of Feedback, Classification of Feedback Amplifiers, General characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier Characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative Problems.

**Oscillators:** Classification of Oscillators, Conditions for Oscillations, RC Phase Shift Oscillator, Generalized analysis of LC oscillators - Hartley, and



Colpitts Oscillators, Wien-Bridge & Crystal Oscillators, Stability of Oscillators.

#### **UNIT –IV:**

**Large Signal Amplifiers :** Classification, Class A Large Signal Amplifiers, Transformer Coupled Class A Audio Power Amplifier, Efficiency of Class A Amplifier, Class B Amplifier, Efficiency of Class B Amplifier, Class-B Push-Pull Amplifier, Complementary Symmetry Class B Push-Pull Amplifier, Distortion in Power Amplifiers, Thermal Stability and Heat Sinks.

#### **UNIT –V:**

**Tuned Amplifiers:** Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading Single Tuned Amplifiers on Bandwidth, Effect of Cascading Double Tuned Amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned Amplifiers.

#### **TEXT BOOKS:**

1. Integrated Electronics - Jacob Millman and Christos C Halkias, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits, B. P. Singh, Rekha Singh, Pearson, 2013.
3. Design of Analog CMOS Integrated Circuits – Behzad Razavi, 2008, TMH.

#### **REFERENCE BOOKS:**

1. Electronic Circuit Analysis – Rashid, Cengage Learning, 2013
2. Electronic Devices and Circuit Theory - Robert L. Boylestad, Louis Nashelsky, 9 Ed., 2008 PE.
3. Microelectric Circuits – Sedra and Smith – 5 Ed., 2009, Oxford University Press.
4. Electronic Circuit Analysis – K. Lal Kishore, 2004, BSP.
5. Electronic Devices and Circuits - S. Salivahanan, N. Suresh Kumar, A Vallavaraj, 2 Ed., 2009, TMH.

#### **Course Outcomes:**

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

- Design and analyse the DC bias circuitry of BJT and FET.
- Analyse the different types of amplifiers, operation and its characteristics
- Design circuits like amplifiers, oscillators using the transistors diodes and oscillators.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-II Sem**

L	T/P/D	C
4	-/-	4

**(A40415) PULSE AND DIGITAL CIRCUITS****Objectives:**

The main objectives are:

- To explain the complete response of R-C and R-L-C transient circuits.
- To explain clippers, clampers, switching characteristics of transistors and sampling gates.
- To construct various multivibrators using transistors, design of sweep circuits and sampling gates.
- To discuss and realize logic gates using diodes and transistors.

**UNIT-I:**

**Linear Wave Shaping:** High pass and low pass RC circuits and their response for Sinusoidal, Step, Pulse, Square, & Ramp inputs, High pass RC network as Differentiator, Low pass RC circuit as an Integrator, Attenuators and its application as a CRO Probe, RL and RLC Circuits and their response for Step Input, Ringing Circuit.

**UNIT-II:**

**Non-Linear Wave Shaping:** Diode clippers, Transistor clippers, Clipping at two independent levels, Comparators, Applications of Voltage comparators. Clamping Operation, Clamping circuit taking Source and Diode resistances into account, Clamping Circuit Theorem, Practical Clamping Circuits, Effect of Diode Characteristics on Clamping Voltage, Synchronized Clamping.

**UNIT-III:**

**Switching Characteristics of Devices :** Diode as a Switch, Piecewise Linear Diode Characteristics, Diode Switching times, Transistor as a Switch, Break down voltages, Transistor in Saturation, Temperature variation of Saturation Parameters, Transistor-switching times, Silicon-controlled-switch circuits, Sampling Gates : Basic operating principles of Sampling Gates, Unidirectional and Bi-directional Sampling Gates, Four Diode Sampling Gate, Reduction of pedestal in Gate Circuits

**UNIT-IV:**

**Multivibrators:** Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors, Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, Miller and Bootstrap

Time Base Generators-Basic Principles, Transistor Miller Time Base generator, Transistor Bootstrap Time Base Generator, Transistor Current Time Base Generators, Methods of Linearity improvement.

**UNIT-V:**

**Synchronization and Frequency Division:** Pulse Synchronization of Relaxation Devices, Frequency division in Sweep Circuit, Stability of Relaxation Devices, Astable Relaxation Circuits, Monostable Relaxation Circuits, Synchronization of a Sweep Circuit with Symmetrical Signals, Sine wave frequency division with a Sweep Circuit, A Sinusoidal Divider using Regeneration and Modulation.

**Realization of Logic Gates Using Diodes & Transistors:** AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL and CML Logic Families and its Comparison.

**TEXT BOOKS:**

1. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 Ed., 2008, TMH.
2. Solid State Pulse Circuits –David A. Bell, 4 Ed., 2002 PHI.

**REFERENCE BOOKS:**

1. Pulse and Digital Circuits – A. Anand Kumar, 2005, PHI.
2. Fundamentals of Pulse and Digital Circuits- Ronald J. Tocci, 3 Ed., 2008.
3. Pulse and Digital Circuits – Motheki S. Prakash Rao, 2006, TMH.
4. Wave Generation and Shaping - L. Strauss.

**Outcomes:**

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

- Understand the applications of diode as integrator, differentiator, clippers, clamper circuits..
- Learn various switching devices such as diode, transistor, SCR.
- Difference between logic gates and sampling gates
- Design multivibrators for various applications, synchronization techniques and sweep circuits.
- Realizing logic gates using diodes and transistors.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A40009) ENVIRONMENTAL STUDIES****Objectives:**

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

**UNIT-I :**

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT-II:**

**Natural Resources:** Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

**UNIT-III:**

**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT-IV:**

**Environmental Pollution and Control Technologies:** Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition

and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

#### **UNIT-V:**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

#### **SUGGESTED TEXT BOOKS:**

- 1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

#### **REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B.Botkin & Edward A.Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

#### **Outcomes:**

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-II Sem**

L	T/P/D	C
4	-/-	4

**(A40411) ELECTROMAGNETIC THEORY AND TRANSMISSION LINES****Course Objectives:**

The course objectives are:

- To introduce the student to the fundamental theory and concepts of electromagnetic waves and transmission lines, and their practical applications.
- To study the propagation, reflection, and transmission of plane waves in bounded and unbounded media.

**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, Inductances and Magnetic Energy, 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, Power Loss in a Plane Conductor., 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;  $\lambda/4$ ,  $\lambda/2$ ,  $3\lambda/4$  Lines – Impedance Transformations, Significance of  $Z_{min}$  and  $Z_{max}$ , Smith Chart – Configuration and Applications, Single and Double Stub Matching, Illustrative Problems.

#### **TEXT BOOKS:**

1. Elements of Electromagnetics – Matthew N.O. Sadiku, 4thEd., Oxford Univ.Press.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2ndEd., 2000, PHI.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

#### **REFERENCE BOOKS:**

1. Engineering Electromagnetics – Nathan Ida, 2ndEd., 2005, Springer (India) Pvt. Ltd., New Delhi.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 7thEd., 2006, TMH.
3. Electromagnetic Field Theory and Transmission Lines – G. Sashibhushana Rao, Wiley India, 2013.
4. Networks, Lines and Fields – John D. Ryder, 2ndEd., 1999, PHI.

#### **Course Outcomes:**

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

- Study time varying Maxwell's equations and their applications in electromagnetic problems.
- Determine the relationship between time varying electric and magnetic field and electromotive force.
- Analyze basic transmission line parameters in phasor domain.

- Use Maxwells equations to describe the propagation of electromagnetic waves in vacuum.
- Show how waves propagate in dielectrics and lossy media.
- Demonstrate the reflection and refraction of waves at boundaries.
- Explain the basic wave guide operation and parameters.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A40410) DIGITAL DESIGN USING VERILOG HDL****Course Objectives:**

This course teaches:

- Designing digital circuits, behavioral and RTL modeling of digital circuits using Verilog HDL, verifying these models, and synthesizing RTL models to standard cell libraries and FPGAs.
- Students gain practical experience by designing, modeling, implementing and verifying several digital circuits

This course aims to provide students with the understanding of the different technologies related to HDLs, construct, compile and execute Verilog HDL programs using provided software tools. Design digital components and circuits that are testable, reusable and synthesizable.

**UNIT -I:**

**Introduction to Verilog HDL:** Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools

**Language Constructs and Conventions:** Introduction, Keywords, Identifiers, White space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data types, Scalars and Vectors, Parameters, Operators.

**UNIT -II:**

**Gate Level Modeling:** Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip –Flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuit.

**Modeling at Dataflow Level:** Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.

**UNIT -III:**

**Behavioral Modeling:** Introduction, Operations and Assignments, Functional Bifurcation, 'Initial' Construct, 'Always' Construct, Assignments with Delays, 'Wait' Construct, Multiple Always Block, Designs at Behavioral Level, Blocking and Non- Blocking Assignments, The 'Case' Statement, Simulation Flow 'If' an 'If-Else' Constructs, 'Assign- De-Assign' Construct, 'Repeat' Construct, for Loop, 'The Disable' Construct, 'While Loop', Forever Loop, Parallel Blocks, 'Force- Release, Construct, Event.

**UNIT -IV:**

**Switch Level Modeling:** Basic Transistor Switches, CMOS Switches, Bi Directional Gates, Time Delays With Switch Primitives, Instantiation with 'Strengths' and 'Delays', Strength Contention with Trireg Nets.

**System Tasks, Functions and Compiler Directives:** Parameters, Path Delays, Module Parameters, System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

**UNIT -V:**

**Sequential Circuit Description:** Sequential Models – Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis

Component Test and Verification: Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.

**TEXT BOOKS:**

1. T R. Padmanabhan, B Bala Tripura Sundari, Design Through Verilog HDL, Wiley, 2009.
2. Zainalabdien Navabi, Verilog Digital System Design, TMH, 2nd Edition.

**REFERENCE BOOKS:**

1. Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition, 2010.
2. Advanced Digital Logic Design using Verilog, State Machine & Synthesis for FPGA - Sunggu Lee, Cengage Learning, 2012.
3. Verilog HDL – Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
4. Advanced Digital Design with the Verilog HDL – Michel D. Ciletti, PHI, 2009.

**Course Outcomes:**

By the end of this course, students should be able to:

- Describe Verilog hardware description languages (HDL).
- Design digital circuits;
- Write behavioral models of digital circuits;
- Write Register Transfer Level (RTL) models of digital circuits;
- Verify behavioral and RTL models;
- Describe standard cell libraries and FPGAs;
- Synthesize RTL models to standard cell libraries and FPGAs;
- Implement RTL models on FPGAs and testing & verification.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-II Sem****L T/P/D C****- -/3/- 2****(A40288) ELECTRICAL TECHNOLOGY LAB****PART –A:**

1. Verification of KVL and KCL.
2. Serial and Parallel Resonance.
3. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
4. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
5. Two port network parameters – ABCD and h- Parameters
6. Verification of Superposition and Reciprocity theorems.
7. Verification of maximum power transfer theorem.
8. Verification of Thevenin's and Norton's theorems.

**PART –B:**

1. Magnetization characteristics of D.C. Shunt generator.
2. Swinburne's Test on DC shunt machine.
3. Brake test on DC shunt motor.
4. OC & SC tests on Single-phase transformer.
5. Load Test on Single Phase Transformer.

Note: Any 12 of the above experiments are to be conducted.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****II Year B.Tech. ECE-II Sem****L T/P/D C****- -/3/- 2****(A40484) ELECTRONIC CIRCUITS AND PULSE CIRCUITS LAB**

List of Experiments (16 experiments to be done):

**PART –I: ELECTRONIC CIRCUITS**

Minimum eight experiments to be conducted:

- I) Design and Simulation in Simulation Laboratory using any Simulation Software (Minimum 6 Experiments):
  1. Common Emitter Amplifier
  2. Common Source Amplifier
  3. Two Stage RC Coupled Amplifier
  4. Current shunt and Voltage Series Feedback Amplifier
  5. Cascode Amplifier
  6. Wien Bridge Oscillator using Transistors
  7. RC Phase Shift Oscillator using Transistors
  8. Class A Power Amplifier (Transformer less)
  9. Class B Complementary Symmetry Amplifier
  10. Common Base (BJT) / Common Gate (JFET) Amplifier.
- II) Testing in the Hardware Laboratory (Minimum 2 Experiments)
  1. Class A Power Amplifier (with transformer load)
  2. Class C Power Amplifier
  3. Single Tuned Voltage Amplifier
  4. Hartley & Colpitt's Oscillators
  5. Darlington Pair
  6. MOS Common Source Amplifier

**Equipment required for the Laboratory:**

1. For software simulation of Electronic circuits
  - i) Computer Systems with latest specifications
  - ii) Connected in LAN (Optional)
  - iii) Operating system (Windows XP)
  - iv) Suitable Simulations software
2. For Hardware simulations of Electronic Circuits
  - i) Regulated Power Supply (0-30V)
  - ii) CRO's

- iii) Functions Generators
- iv) Multimeters
- v) Components
- 3. Win XP/ Linux etc.

### **PART –II: PULSE CIRCUITS**

Minimum eight experiments to be conducted:

1. Linear Wave Shaping
  - a. RC Low Pass Circuit for different time constants
  - b. RC High Pass Circuit for different time constants
2. Non-linear wave shaping
  - a. Transfer characteristics and response of Clippers:
    - i) Positive and Negative Clippers
    - ii) Clipping at two independent levels
  - b. The steady state output waveform of clampers for a square wave input
    - i) Positive and Negative Clampers
    - ii) Clamping at reference voltage
3. Comparison Operation of Comparators
4. Switching characteristics of a transistor
5. Design a Bistable Multivibrator and draw its waveforms
6. Design an Astable Multivibrator and draw its waveforms
7. Design a Monostable Multivibrator and draw its waveforms
8. Response of Schmitt Trigger circuit for loop gain less than and greater than one
9. UJT relaxation oscillator
10. The output- voltage waveform of Boot strap sweep circuit
11. The output- voltage waveform of Miller sweep circuit

Equipment required for Laboratories:

- Regulated Power Supply - 0 – 30 V
- CRO - 0 – 20 M Hz.
- Function Generators - 0 – 1 M Hz
- Components
- Multi Meters

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A50217) CONTROL SYSTEMS ENGINEERING****Objective:**

- In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

**UNIT –I:**

**Introduction:** Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback, Mathematical models – Differential equations, Impulse Response and transfer functions.

**Transfer Function Representation:** Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

**UNIT -II:**

**Time Response Analysis:** Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

**UNIT –III:**

**Stability Analysis in S-Domain:** The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

**Root Locus Technique:** The root locus concept - construction of root loci- effects of adding poles and zeros to  $G(s)$   $H(s)$  on the root loci.

**UNIT –IV:**

**Frequency Response Analysis:** Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots-Stability Analysis. Compensation techniques – Lag, Lead and Lead-Lag Controllers design in frequency Domain, PID Controllers.

**UNIT –V:**

**State Space Analysis of Continuous Systems:** Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

**TEXT BOOKS:**

1. Control Systems Theory and Applications - S.K Bhattacharya, Pearson.
2. Control Systems - N.C.Jagan, BS Publications.

**REFERENCE BOOKS:**

1. Control systems - A.Ananad Kumar, PHI.
2. Control Systems Engineering - S.Palani, Tata-McGraw-Hill.
3. Control systems - Dhanesh N.Manik, Cengage Learning.
4. Control Systems Engineering - I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers.
5. Control Systems - N.K.Sinha, New Age International (P) Limited Publishers.

**Outcome:**

After going through this course the student gets a thorough knowledge on open loop and closed loop control systems, concept of feedback in control systems, mathematical modeling and transfer function derivations of Synchros, AC and DC servo motors, Transfer function representation through block diagram algebra and signal flow graphs, time response analysis of different ordered systems through their characteristic equation and time-domain specifications, stability analysis of control systems in S-domain through R-H criteria and root-locus techniques, frequency response analysis through bode diagrams, Nyquist, polar plots and the basics of state space analysis, design of PID controllers, lag, lead, lag-lead compensators, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A50516) COMPUTER ORGANIZATION AND OPERATING SYSTEMS****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.

**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, Virtual



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, SafeaZaky, 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 6th Edition, Pearson
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI
3. Fundamentals of Computer Organization and Design - Sivaraama Dandamudi Springer Int. Edition.
4. Operating Systems – Internals and Design Principles, Stallings, 6th 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.

**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.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A50418) ANTENNAS AND WAVE PROPAGATION****Course Objectives:**

The main objectives are:

- Understand basic terminology and concepts of Antennas.
- To attain knowledge on the basic parameters those are considered in the antenna design process and the analysis while designing that.
- Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis.
- To have knowledge on antenna operation and types as well as their usage in real time field.
- Aware of the wave spectrum and respective band based antenna usage and also to know the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

**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 and Large 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 Monofilar 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. Impact of Different Parameters on Characteristics, Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems.

**Lens Antennas** – Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

**UNIT -IV:**

**Antenna Arrays:** Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire 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, Pattern Measurement Arrangement, 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, TMH, 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, 3rd Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition, 1955.
5. Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd Ed. 1988.

**Course Outcomes:**

Student will be:

- Aware of the parameter considerations viz. antenna efficiency, beam efficiency, radiation resistance etc. in the design of an antenna.
- Capable to analyze the designed antenna and field evaluation under various conditions and formulate the electric as well as the magnetic fields Equation set for Far field and near field conditions.
- Understand the Array system of different antennas and field analysis under application of different currents to the individual antenna elements
- Understand the design issues, operation of fundamental antennas like Yagi-Uda, Horn antennas and helical structure and also their operation methodology in practice.
- Design a lens structure and also the bench setup for antenna parameter measurement of testing for their effectiveness.
- Knowledge about the means of propagation of Electromagnetic wave i.e. free space propagation and also about frequency dependent layer selection, its respective issues for an effective transmission of information in the form of EM wave to a remote location and related issues.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A50422) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION****Course Objectives:**

This course provides:

- An introduction to measurement techniques and instrumentation design and operation.
- The basic concept of units, measurement error and accuracy, the construction and design of measuring devices and circuits, measuring instruments and their proper applications.
- To use different measuring techniques and the measurement of different physical parameters using different transducers.

**UNIT -I:**

**Block Schematics of Measuring Systems:** Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag ;Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

**UNIT -II:**

**Signal Analyzers:** AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

**UNIT -III:**

**Oscilloscopes:** CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

**Special Purpose Oscilloscopes:** Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

**UNIT -IV:**

**Transducers:** Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance

Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

**UNIT -V:**

**Bridges:** Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

**Measurement of Physical Parameters:** Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature - Measurements, Data Acquisition Systems.

**TEXT BOOKS:**

1. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbins, W.D. Cooper: PHI 5th Edition 2003

**REFERENCE BOOKS:**

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
3. Measurement Systems – Ernest O. Doebelin and Dhanesh N Manik, 6th Ed., TMH,
4. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
5. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

**Course Outcomes:**

Upon a successful completion of this course, the student will be able to:

- Describe the fundamental concepts and principles of instrumentation.
- Explain the operations of the various instruments required in measurements.
- Apply the measurement techniques for different types of tests.
- To select specific instrument for specific measurementfunction.
- Understand principle of operation, working of different electronic instruments like digital multi meter, vector voltmeter.
- Learners will apply knowledge of different oscilloscopes like CRO, DSO.
- Students will understand functioning, specification, and applications of signal analyzing instruments.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A50408) ANALOG COMMUNICATIONS****Course Objectives:**

This course aims at:

- Developing and understanding of the design of Analog communication system.
- Study of analog modulation techniques.
- Subject will develop analytical abilities related to Circuit members.
- Establishing a firm foundation for the understanding of telecommunication systems, and the relationship among various technical factors when such systems are designed and operated.

**UNIT –I:**

**Amplitude Modulation:** Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector, Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop.

**UNIT –II:**

**SSB Modulation:** Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

**UNIT –III:**

**Angle Modulation:** Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM and AM.

**UNIT –IV:**

**Noise in Analog communication System:** Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extraterrestrial Noise, Arbitrary Noise Sources, White Noise, Narrowband Noise- In phase and quadrature phase



components and its Properties, Modeling of Noise Sources, Average Noise Bandwidth, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks.

Noise in DSB and SSB System Noise in AM System, Noise in Angle Modulation System, Noise Triangle in Angle Modulation System, Pre-emphasis and de-emphasis

#### **UNIT –V:**

**Receivers:** Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

Pulse Modulation: Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation and demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing.

#### **TEXTBOOKS:**

1. Communication Systems–Simon Haykin, 2 Ed, Wiley Publications.
2. Communication Systems – B.P. Lathi, BS Publication , 2004.

#### **REFERENCE BOOKS:**

1. Electronic Communications – Dennis Roddy and John Coolean, 4th Edition,PEA, 2004
2. Electronic Communication Systems – Modulation and Transmission - Robert J. Schoenbeck, 2nd Edition, PHI.
3. Analog and Digital Communication – K. Sam Shanmugam, Willey ,2005
4. Electronics & Communication System – George Kennedy and Bernard Davis , TMH 2004.
5. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 , 3rd Edition

#### **Course Outcomes:**

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

- Conceptually understand the baseband signal & system.
- Identify various elements, processes, and parameters in telecommunication systems, and describe their functions, effects, and interrelationship.
- Design procedure of AM Transmission & Reception, analyze, measure, and evaluate the performance of a telecommunication system against given criteria.
- Understand basic knowledge of FM Transmission & Reception
- Understand various types of SSB Transmission & Reception.
- Design typical telecommunication systems that consist of basic and essential building blocks.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A50425) LINEAR AND DIGITAL IC APPLICATIONS****Course Objectives:**

The main objectives of the course are:

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special function ICs.
- To understand and implement the working of basic digital circuits.

**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, Sawtooth, 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, CMOS Transmission Gate, IC interfacing- TTL

Driving CMOS & CMOS Driving TTL, Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - 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. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
3. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005.

#### **REFERENCE BOOKS:**

1. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore, Cengage Learning/ Jaico, 2009.
2. Operational Amplifiers with Linear Integrated Circuits by K.Lal Kishore – Pearson, 2009.
3. Linear Integrated Circuits and Applications – Salivahana, TMH.
4. Modern Digital Electronics – RP Jain – 4/e – TMH, 2010.
5. Digital Design Principles and Practices – John. F. Wakerly 3/e, 2005.
6. Operational Amplifiers with Linear Integrated Circuits, 4/e William D.Stanley, Pearson Education India, 2009.

#### **Course Outcomes:**

On completion of this course, the students will have:

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

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-I Sem**

L	T/P/D	C
-	-3/-	2

**(A50487) ANALOG COMMUNICATIONS LAB**

Note:

Minimum 12 experiments should be conducted:

All these experiments are to be simulated first either using MATLAB, Comsim or any other simulation package and then to be realized in hardware

1. Amplitude modulation and demodulation.
2. DSB-SC Modulator & Detector
3. SSB-SC Modulator & Detector (Phase Shift Method)
4. Frequency modulation and demodulation.
5. Study of spectrum analyzer and analysis of AM and FM Signals
6. Pre-emphasis & de-emphasis.
7. Time Division Multiplexing & De multiplexing
8. Frequency Division Multiplexing & De multiplexing
9. Verification of Sampling Theorem
10. Pulse Amplitude Modulation & Demodulation
11. Pulse Width Modulation & Demodulation
12. Pulse Position Modulation & Demodulation
13. Frequency Synthesizer.
14. AGC Characteristics.
15. PLL as FM Demodulator

Equipment required for the Laboratory:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators - 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Analog Communication
7. Components
8. Radio Receiver/TV Receiver Demo kits or Trainees.
9. Spectrum Analyzer - 60 M Hz.
10. Any one simulation package

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-I Sem****L T/P/D C****- -/3/- 2****(A50488) IC APPLICATIONS AND HDL SIMULATION LAB**

Note: To perform any sixteen experiments (choosing at least seven from each part).

**Part-I: Linear IC Experiments**

1. OP AMP Applications – Adder, Subtractor, Comparators.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. IC 741 Waveform Generators – Sine, Squarewave and Triangular waves.
5. IC 555 Timer – Monostable and Astable Multivibrator Circuits.
6. Schmitt Trigger Circuits – using IC 741
7. IC 565 – PLL Applications.
8. Voltage Regulator using IC 723, Three Terminal Voltage Regulators –7805, 7809, 7912.

**EQUIPMENT REQUIRED:**

- 1 20 MHz/ 40 MHz/60 MHz Oscilloscope.
- 2 1 MHz Function Generator (Sine, Square, Triangular and TTL).
- 3 Regulated Power Supply.
- 4 Multimeter / Volt Meter.

**Part – II: HDL Simulation programs:**

Programming can be done using any compiler. Down load the programs on FPGA/CPLD boards and performance testing may be done using pattern generator/logic analyzer apart from verification by simulation using Cadence / Mentor Graphics / Synopsys /Equivalent front end CAD tools.

- 1 HDL code to realize all the logic gates
- 2 Design of 2-to-4 decoder
- 3 Design of 8-to-3 encoder (without and with Priority)
- 4 Design of 8-to-1 multiplexer and 1x8 demultiplexer.
- 5 Design of 4 bit binary to gray code converter
- 6 Design of 4 bit comparator
- 7 Design of Full adder using 3 modeling styles
- 8 Design of flip flops: SR, D, JK, T
- 9 Design of 4-bit binary, BCD counters ( synchronous/ asynchronous reset)
- 10 Finite State Machine Design

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A60010) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS****Objectives:**

To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations namely: demand and supply, production function, cost analysis, markets, forms of business organisations, capital budgeting and financial accounting and financial analysis.

**Unit I**

**Introduction & Demand Analysis:** Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

**Unit II**

**Production & Cost Analysis:** Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

**Unit III**

**Markets & New Economic Environment:** Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing: Objectives and Policies of Pricing. Methods of Pricing. Business: Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, New Economic Environment: Changing Business Environment in Post-liberalization scenario.

**Unit IV**

**Capital Budgeting:** Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

**Unit V**

**Introduction to Financial Accounting & Financial Analysis:** Accounting concepts and Conventions - Introduction IFRS - Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

**TEXT BOOKS:**

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013.
3. M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012.

**REFERENCES:**

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012
4. Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Shailaja & Usha : MEFA, University Press, 2012.
10. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
11. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.
12. J. V. Prabhakar Rao & P.V. Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

**Outcomes:**

At the end of the course, the student will

- Understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures.

- Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis
- Develop an understanding of
- Analyse how capital budgeting decisions are carried out
- Understand the framework for both manual and computerised accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A60018) HUMAN VALUES AND PROFESSIONAL ETHICS****(Open Elective)****Objectives :** This introductory course input is intended

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

**Unit I:****Course Introduction - Need, Basic Guidelines, Content and Process**

**for Value Education:** Understanding the need, basic guidelines, content and process for Value Education. Self Exploration—what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

**Unit II:****Understanding Harmony in the Human Being - Harmony in Myself! :**

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvridha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

**Unit III:****Understanding Harmony in the Family and Society- Harmony in Human**

**- Human Relationship :** Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha )- from family to world family!

**Unit IV:****Understanding Harmony in the Nature and Existence - Whole existence**

**as Co-existence :** Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

**Unit V:****Implications of the above Holistic Understanding of Harmony on**

**Professional Ethics :** Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

- a) Ability to utilize the professional competence for augmenting universal human order,
- b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
- c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order:

- a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- b) At the level of society: as mutually enriching institutions and organizations

**TEXT BOOKS**

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. KV Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

**REFERENCE BOOKS**

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

**Relevant CDs, Movies, Documentaries & Other Literature:**

1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A60117) DISASTER MANAGEMENT****(Open Elective)****Unit-I**

**Environmental Hazards & Disasters:** Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

**Unit –II**

**Types of Environmental hazards & Disasters:** Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards –

**Unit –III**

**Endogenous Hazards** - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

**Unit –IV**

**Exogenous hazards/ disasters - Infrequent events-** Cumulative atmospheric hazards/ disasters

**Infrequent events:** Cyclones – Lightning – Hailstorms

**Cyclones:** Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation) Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards / Disasters- Physical hazards/ Disasters-Soil Erosion

**Soil Erosion:--** Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion

**Chemical hazards/ disasters:--** Release of toxic chemicals, nuclear explosion- Sedimentation processes Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation

**Biological hazards/ disasters:-** Population Explosion.

#### **Unit –V**

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

#### **TEXT BOOKS:**

1. Disaster Mitigation: Experiences And Reflections by Pardeep Sahni
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

#### **REFERENCES**

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997
3. Kates,B.I & White, G.F The Environment as Hazards, oxford, New York, 1978
4. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
5. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
6. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994
7. Dr. Satender , Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003
8. A.S. Arya Action Plan For Earthquake,Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
9. R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction,CSIR, New Delhi
10. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management, IIPA, New Delhi, 2001

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A60017) INTELLECTUAL PROPERTY RIGHTS****(Open Elective)****UNIT – I**

**Introduction to Intellectual property:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

**Trade Marks :** Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**UNIT – III**

**Law of copy rights :** Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

**Law of patents :** Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

**Trade Secrets :** Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

**Unfair competition :** Misappropriation right of publicity, False advertising.

**UNIT – V**

**New development of intellectual property:** new developments in trade mark law ; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, international development in trade secrets law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual property right, Deborah. E. Bouchoux, cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.,

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A60420) DIGITAL COMMUNICATIONS****Course Objectives:**

The objectives are:

- To understand different digital modulation techniques such as PCM, DM and various shift keying techniques.
- Understand the concepts of different digital modulation techniques.
- To study about different error detecting and error correcting codes like block codes, cyclic codes and convolution codes
- To study the advantages of spread spectrum techniques and performance of spread spectrum, PN codes in jamming, noise etc.

**UNIT -I:**

**Elements of Digital Communication Systems:** Advantages of Digital Communication Systems, Bandwidth-S/N Tradeoff, Hartley Shanon Law and Sampling Theorem.

**Pulse Code Modulation:** 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:**

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

**UNIT -III:**

**Baseband Transmission and Optimal Reception of Digital Signal:** Pulse Shaping for Optimum Transmissions, A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Optimal of Coherent Reception, Signal Space Representation and Probability of Error and Eye Diagrams for ASK, PSK, FSK, Cross Talk.

**Information Theory:** Information and entropy, conditional entropy and redundancy, Shannon Fano coding, Mutual Information, Information loss due to noise, source codings – Huffman Code, variable length coding, Source coding to Increase average Information per bit, Lossy source coding.

**UNIT -IV:****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 using State, Tree and Trellis Diagrams, Decoding using Viterbi Algorithm, Comparison of Error Rates in Coded and Uncoded Transmission.

#### **UNIT -V:**

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

#### **TEXT BOOKS:**

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3rd Edition, Mcgraw-Hill, 2008.
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.
3. Digital Communications – John G. Proakis , Masoud Salehi – 5th Edition, Mcgraw-Hill, 2008.

#### **REFERENCE BOOKS:**

1. Digital Communication – Simon Haykin, John Wiley, 2005.
2. Digital Communications – Ian A. Glover, Peter M. Grant, 2nd Edition, Pearson Edu., 2008.
3. Communication Systems – B.P. Lathi, BS Publication, 2006.
4. A First course in Digital Communications -Nguyen, Shewedyh, Cambride.
5. Digital Communication- Theory, Techniques, and Applications \_ R. N. Mutagi, 2nd Ed. 2013.

#### **Course Outcomes:**

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

- Understand basic components of digital communication systems.
- Design optimum receivers for digital modulation techniques.
- Analyze the error performance of digital modulation techniques.
- Know about different error detecting and error correcting codes like block codes, cyclic codes and convolution codes.
- Understand the advantages of spread spectrum techniques and performance of spread spectrum, PN codes in jamming, noise etc.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A60432) VLSI DESIGN****Course Objectives:**

The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
- Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits.

**UNIT –I:**

**Introduction:** Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS

**Basic Electrical Properties:** Basic Electrical Properties of MOS and BiCMOS Circuits:  $I_{ds}$ - $V_{ds}$  relationships, MOS transistor threshold Voltage,  $g_m$ ,  $g_{ds}$ , Figure of merit  $\eta$ ; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

**UNIT -II:**

**VLSI Circuit Design Processes:** VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2  $\mu$ m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

**UNIT –III:**

**Gate Level Design:** Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

**UNIT -IV:**

**Data Path Subsystems:** Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

**Array Subsystems:** SRAM, DRAM, ROM, Serial Access Memories.

**UNIT -V:**

**Programmable Logic Devices:** PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

**CMOS Testing:** CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

**TEXT BOOKS:**

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. VLSI Design – M. Michael Vai, 2001, CRC Press.

**REFERENCE BOOKS:**

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
5. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

**Course Outcomes:**

Upon successfully completing the course, the student should be able to:

- Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
- Choose an appropriate inverter depending on specifications required for a circuit
- Draw the layout of any logic circuit which helps to understand and estimate parasitics of any logic circuit
- Design different types of logic gates using CMOS inverter and analyze their transfer characteristics
- Provide design concepts required to design building blocks of data path using gates.
- Design simple memories using MOS transistors and can understand Design of large memories.
- design simple logic circuit using PLA, PAL, FPGA and CPLD.
- Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A60430) MICROPROCESSORS AND MICROCONTROLLERS****Course Objective:**

The course objectives are:

- To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

**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- Common Function Signals, Timing diagrams, Interrupts of 8086.

**UNIT -II:****Instruction Set and Assembly Language Programming of 8086:**

Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, Simple Programs involving Logical, Branch and Call Instructions, Sorting, Evaluating Arithmetic Expressions, String Manipulations.

**UNIT -III:**

**I/O Interface:** 8255 PPI, Various Modes of Operation and Interfacing to 8086, Interfacing Keyboard, Display, D/A and A/D Converter.

**Interfacing with advanced devices:** Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

**Communication Interface:** Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.

**UNIT -IV:**

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

**UNIT -V:**

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

**TEXT BOOKS:**

1. D. V. Hall, Microprocessors and Interfacing, TMGH, 2nd Edition 2006.

2. Kenneth. J. Ayala, The 8051 Microcontroller , 3rd Ed., Cengage Learning.

**REFERENCE BOOKS:**

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH, 2nd Edition 2006.
2. The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - Liu and GA Gibson, PHI, 2nd Ed.
4. Microcontrollers and Application - Ajay. V. Deshmukh, TMGH, 2005.
5. The 8085 Microprocessor: Architecture, programming and Interfacing – K.Uday Kumar, B.S.Umashankar, 2008, Pearson

**Course Outcome:**

Upon completion of the course:

- The student will learn the internal organization of popular 8086/8051 microprocessors/microcontrollers.
- The student will learn hardware and software interaction and integration.
- The students will learn the design of microprocessors/microcontrollers-based systems.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A60421) DIGITAL SIGNAL PROCESSING****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.

**UNIT -I:**

**Introduction: Introduction to Digital Signal Processing:** Discrete Time Signals & Sequences, Linear Shift Invariant Systems, Stability, and Causality, 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 series:** DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, 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.

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, 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

**REFERENCE BOOKS:**

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 – S.Salivahanan, A.Vallavaraj and C.Gnanapriya, TMH, 2009
4. Discrete Systems and Digital Signal Processing with MATLAB – Taan S. ElAli, CRC press, 2009.
5. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeakor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009.
6. Digital Signal Processing - Nagoor Khani, TMG, 2012

**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 roundoff 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.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****- -/3/- 2****(A60494) MICROPROCESSORS AND MICROCONTROLLERS LAB**

Note: Minimum of 12 experiments are 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 for 8086 (using Various Addressing Modes).
- 2 Program for sorting an array for 8086.
- 3 Program for searching for a number or character in a string for 8086.
- 4 Program for string manipulations for 8086.
- 5 Program for digital clock design using 8086.
- 6 Interfacing ADC and DAC to 8086.
- 7 Parallel communication between two microprocessors 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.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****III Year B.Tech. ECE-II Sem****L T/P/D C****- -/3/- 2****(A60493) DIGITAL SIGNAL PROCESSING LAB**

Note:

- Minimum of 12 experiments are to be conducted.
- The programs shall be implemented in software (Using MATLAB / Lab view / C programming/OCTAVE Equivalent) and hardware (Using TI / Analog devices / Motorola / Equivalent DSP processors).

**List of Experiments:**

- 1 Generation of Sinusoidal waveform / signal based on recursive difference equations
- 2 To find DFT / IDFT of given DT signal
- 3 To find frequency response of a given system given in (Transfer Function/ Differential equation form).
- 4 Implementation of FFT of given sequence
- 5 Determination of Power Spectrum of a given signal(s).
- 6 Implementation of LP FIR filter for a given sequence
- 7 Implementation of HP FIR filter for a given sequence
- 8 Implementation of LP IIR filter for a given sequence
- 9 Implementation of HP IIR filter for a given sequence
- 10 Generation of Sinusoidal 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 Audio application such as to plot a time and frequency display of microphone plus a cosine using DSP. Read a .wav file and match with their respective spectrograms.
- 16 Noise removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.
- 17 Impulse response of first order and second order systems.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70014) MANAGEMENT SCIENCE****Objectives:**

This course is intended to familiarise the students with the framework for the managers and leaders available for understanding and making decisions relating to issues related organisational structure, production operations, marketing, Human resource Management, product management and strategy.

**UNIT -I:**

**Introduction to Management and Organisation:** Concepts of Management and organization- nature, importance and Functions of Management, Systems Approach to Management - Taylor's Scientific Management Theory – Fayal's Principles of Management – Maslow's theory of Hierarchy of Human Needs – Douglas McGregor's Theory X and Theory Y – Hertzberg Two Factor Theory of Motivation - Leadership Styles, Social responsibilities of Management. Designing Organisational Structures: Basic concepts related to Organisation - Departmentation and Decentralisation, Types and Evaluation of mechanistic and organic structures of organisation and suitability.

**UNIT -II:**

**Operations and Marketing 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 – Business Process Reengineering (BPR) - Statistical Quality Control: control charts for Variables and Attributes (simple Problems) and Acceptance Sampling, TQM, Six Sigma, Deming's contribution to quality. Objectives of Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records – JIT System, Supply Chain Management, Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

**UNIT -III:**

**Human Resources Management (HRM):** 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, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating – Capability Maturity Model (CMM) Levels – Performance Management System.

**UNIT -IV:**

**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 problems).

#### **UNIT -V:**

**Strategic Management and Contemporary Strategic Issues:** Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

#### **TEXT BOOKS:**

1. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.
2. P. Vijaya Kumar, N. Appa Rao and Ashima B. Chhalill, Cengage Learning India Pvt Ltd, 2012.

#### **REFERENCE BOOKS:**

1. Kotler Philip and Keller Kevin Lane: Marketing Management, Pearson, 2012.
2. Koontz and Weihrich: Essentials of Management, McGraw Hill, 2012.
3. Thomas N. Duening and John M. Ivancevich Management—Principles and Guidelines, Biztantra, 2012.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2012.
5. Samuel C. Certo: Modern Management, 2012.
6. Schermerhorn, Capling, Poole and Wiesner: Management, Wiley, 2012.
7. Parnell: Strategic Management, Cengage, 2012.
8. Lawrence R Jauch, R. Gupta and William F. Glueck: Business Policy and Strategic Management, Frank Bros. 2012.
9. Aryasri: Management Science, McGraw Hill, 2012

#### **Outcomes:**

By the end of the course, the student will be in a position to

- Plan an organisational structure for a given context in the organisation
- carry out production operations through Work study.
- understand the markets, customers and competition better and price the given products appropriately.
- ensure quality for a given product or service
- plan and control the HR function better
- plan, schedule and control projects through PERT and CPM
- evolve a strategy for a business or service organisation.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70442) MICROWAVE ENGINEERING****Course Objectives:**

The objectives of the course are:

- To develop the knowledge on transmission lines for microwaves, cavity resonators and wave guide components and applications.
- To enable the students understand and analyze the operation of Microwave tubes like klystron, magnetron, travelling wave tube, etc.,
- To familiarize with microwave solid state devices.
- To understand the scattering matrix parameters and its use.
- To introduce the student the microwave test bench for measure different parameters like attenuation, VSWR, etc.,

**UNIT-I:**

**Microwave Transmission Lines - I:** Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Illustrative Problems.

**Rectangular Guides:** Power Transmission and Power Losses, Impossibility of TEM Mode, Micro strip Lines– Introduction,  $Z_0$  Relations, Effective Dielectric Constant, Losses, Q factor.

**UNIT-II:**

**Cavity Resonators–** Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

**Waveguide Components and Applications:** Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee. Directional Couplers – 2 Hole, Bethe Hole types, Illustrative Problems

Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite

Components – Gyrator, Isolator, Circulator.

#### UNIT-III:

**Microwave Tubes:** Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics, Effect of Repeller Voltage on Power O/P, Illustrative Problems.

**Helix TTS:** Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

#### UNIT-IV:

##### M-Type Tubes:

Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics, Illustrative Problems

**Microwave Solid State Devices:** Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Basic Modes of Operation - Gunn Oscillation Modes, LSA Mode, Introduction to Avalanche Transit Time Devices.

#### UNIT-V:

**Microwave Measurements:** Scattering Matrix– Significance, Formulation and Properties, S Matrix Calculations for – 2 port Junctions, E plane and H plane Tees, Magic Tee, Circulator and Isolator, Illustrative Problems.

Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometers Measurement of Attenuation, Frequency Standing Wave Measurements – Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

#### TEXT BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

#### REFERENCE BOOKS:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.

2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Ed., 1955.
5. Microwave Engineering – A. Das and S.K. Das, TMH, 2nd Ed., 2009.
6. Microwave Engineering - G. S. Raghuvanshi and K. Satya Prasad, Cengage Learning, 2012.

**Course Outcomes:**

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

- Understand the significance of microwaves and microwave transmission lines.
- Analyze the characteristics of microwave tubes and compare them.
- Be able to list and explain the various microwave solid state devices.
- Can set up a microwave bench for measuring microwave parameters.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70515) COMPUTER NETWORKS****Objectives:**

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce UDP and TCP Models.

**UNIT-I**

**Overview of the Internet:** Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP reference model.

**Physical Layer:** Guided transmission media, wireless transmission media.

Data Link Layer – design issues, CRC Codes, Elementary Data link Layer protocols, sliding window protocol

**UNIT-II**

Multiple Access Protocols –ALOHA, CSMA, Collision free protocols, Ethernet-Physical Layer, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters , hubs, bridges , switches, routers and gateways.

**UNIT-III**

**Network Layer:** Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

**UNIT-IV**

**Internetworking:** Tunneling, Internetwork Routing, Packet fragmentation, IPv4, Ipv6 Protocol, IP addresses, CIDR, IMCP, ARP, RARP, DHCP.

**Transport Layer:** Services provided to the upper layers elements of transport protocol-addressing connection establishment, connection release, Connection Release, Crash Recovery.

**UNIT-V**

The Internet Transport Protocols UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols- Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP

Connection Release, The TCP Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP.

Application Layer-Introduction ,providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH

**TEXT BOOKS:**

1. Data Communications and Networking – Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education.

**REFERENCE BOOKS:**

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning.
3. Introduction to Computer Networks and Cyber Security, Chwan-Hwa (John) Wu, J. David Irwin, CRC Press.
4. Computer Networks, L.L.Peterson and B.S.Davie,4th edition, ELSEVIER.
5. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose,K.W.Ross,3rd Edition, Pearson Education.

**Outcomes:**

- Students should be understand and explore the basics of Computer Networks and Various Protocols. He/She will be in a position to understand the World Wide Web concepts.
- Students will be in a position to administrate a network and flow of information further he/she can understand easily the concepts of network security, Mobile and ad hoc networks.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70434) CELLULAR AND MOBILE COMMUNICATIONS****Course Objectives:**

The course objectives are:

- To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
- To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel
- To provide the student with an understanding of Co-channel and Non-Co-channel interferences
- To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
- To give the student an understanding of frequency management, Channel assignment and types of handoff.

**UNIT -I:**

**Introduction to Cellular Mobile Radio Systems:** Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

**Fundamentals of Cellular Radio System Design:** Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

**UNIT -II:**

**Co-Channel Interference:** Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

**Non-Co-Channel Interference:** Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

**UNIT -III:**

**Cell Coverage for Signal and Traffic:** Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct

and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

**Cell Site and Mobile Antennas:** Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

#### **UNIT -IV:**

**Frequency Management and Channel Assignment:** Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

#### **UNIT -V:**

**Handoffs and Dropped Calls:** Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

#### **TEXT BOOKS:**

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
3. Mobile Cellular Communication - Gottapu sashibhushana Rao, Pearson, 2012.

#### **REFERENCE BOOKS:**

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2nd Edn., 2001.
2. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Education, 2005.
3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

#### **Course Outcomes:**

By the end of the course, the student will be able to analyze and design wireless and mobile cellular systems.

- The student will be able to understand impairments due to multipath fading channel.

- The student will be able understand the fundamental techniques to overcome the different fading effects.
- The student will be able to understand Co-channel and Non-Co-channel interferences
- The student will be able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
- The student will have an understanding of frequency management, Channel assignment and types of handoff.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70436) DIGITAL IMAGE PROCESSING****(Elective-I)****Course Objectives:**

The objectives of the course are to:

- Provide the student with the fundamentals of digital image processing.
- Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
- Introduce the students to some advanced topics in digital image processing.
- Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field.

**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 Operation, Types of Point Operation, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood Operation, Median Filter, Spatial Domain High-Pass Filtering.**Image Enhancement (Frequency Domain):** Filtering in Frequency Domain, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the 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, The 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, 3rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

**REFERENCE BOOKS:**

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2nd Ed, CRC Press, 2011
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
3. Fundamentals of Digital Image Processing – A.K.Jain , PHI, 1989
4. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
5. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2nd Edition
6. Introduction to Image Processing & Analysis – John C. Russ, J. Christian Russ, CRC Press, 2010.
7. Digital Image Processing with MATLAB & Labview – Vipula Singh, Elsevier.

**Course Outcomes:**

Upon successfully completing the course, the student should:

- Have an appreciation of the fundamentals of Digital image processing including the topics of filtering, transforms and morphology, and image analysis and compression.

- Be able to implement basic image processing algorithms in MATLAB.
- Have the skill base necessary to further explore advanced topics of Digital Image Processing.
- Be in a position to make a positive professional contribution in the field of Digital Image Processing.

At the end of the course the student should have a clear impression of the breadth and practical scope of digital image processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70443) MULTIMEDIA AND SIGNAL CODING****(Elective-I)****Course Objectives:**

The course is designed:

- To provide an introduction to the fundamental principles and techniques in Multimedia Signal coding and compression.
- To give an overview of current multimedia standards and technologies.
- To provide techniques related to computer and multimedia networks.
- To provide knowledge related to Multimedia Network Communications and Applications.

**UNIT -I:**

**Introduction to Multimedia:** Multimedia, World Wide Web, Overview of Multimedia Tools, Multimedia Authoring, Graphics/ Image Data Types, and File Formats.

**Color in Image and Video:** Color Science – Image Formation, Camera Systems, Gamma Correction, Color Matching Functions, CIE Chromaticity Diagram, Color Monitor Specifications, Out-of-Gamut Colors, White Point Correction, XYZ to RGB Transform, Transform with Gamma Correction, L\*A\*B\* Color Model. Color Models in Images – RGB Color Model for CRT Displays, Subtractive Color: CMY Color Model, Transformation from RGB to CMY, Under Color Removal: CMYK System, Printer Gamuts, Color Models in Video – Video Color Transforms, YUV Color Model, YIQ Color Model, Ycbcr Color Model.

**UNIT -II:**

**Video Concepts:** Types of Video Signals, Analog Video, Digital Video.

**Audio Concepts:** Digitization of Sound, Quantization and Transmission of Audio.

**UNIT -III:****Compression Algorithms:**

**Lossless Compression Algorithms:** Run Length Coding, Variable Length Coding, Arithmetic Coding, Lossless JPEG, Image Compression.

**Lossy Image Compression Algorithms:** Transform Coding: KLT And DCT Coding, Wavelet Based Coding.

**Image Compression Standards:** JPEG and JPEG2000.

**UNIT -IV:**

**Video Compression Techniques:** Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261- Intra-Frame and Inter-Frame Coding, Quantization, Encoder and Decoder, Overview of MPEG1 and MPEG2.

**UNIT -V:**

**Audio Compression Techniques:** ADPCM in Speech Coding, G.726 ADPCM, Vocoder – Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP, Hybrid Excitation Vocoder, MPEG Audio – MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithms, MPEG-2 AAC, MPEG-4 Audio.

**TEXT BOOKS:**

1. Fundamentals of Multimedia – Ze- Nian Li, Mark S. Drew, PHI, 2010.
2. Multimedia Signals & Systems – Mrinal Kr. Mandal Springer International Edition 1st Edition, 2009

**REFERENCE BOOKS:**

1. Multimedia Communication Systems – Techniques, Stds & Networks K.R. Rao, Zorans. Bojkoric, Dragorad A. Milovanovic, 1st Edition, 2002.
2. Fundamentals of Multimedia Ze- Nian Li, Mark S. Drew, Pearson Education (LPE), 1st Edition, 2009.
3. Multimedia Systems John F. Koegel Bufond Pearson Education (LPE), 1st Edition, 2003.
4. Digital Video Processing – A. Murat Tekalp, PHI, 1996.
5. Video Processing and Communications – Yaowang, Jorn Ostermann, Ya-QinZhang, Pearson, 2002

**Course Outcomes:**

- Upon completing the course, the student will be able to:
- Understand the fundamentals behind multimedia signal processing.
- Understand the fundamentals behind multimedia compression.
- Understand the basic principles behind existing multimedia compression and communication standards.
- Understand future multimedia technologies.
- Apply the acquired knowledge to specific multimedia related problems and projects at work.
- Take advanced courses in this area.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70505) OBJECT ORIENTED PROGRAMMING THROUGH JAVA****(Elective-I)****Learning Objectives:**

- To understand object oriented programming concepts, and apply them in problem solving
- To learn the basics of java Console and GUI based programming

**UNIT -I:**

**Object Oriented Thinking and Java Basics:** Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.

**UNIT -II:**

**Inheritance, Packages and Interfaces:** Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object Class.

Defining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.

**UNIT -III:**

**Exception Handling and Multithreading:** Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.

String Handling, Exploring Java.Util, Differences between Multi-Threading

and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads.

Enumerations, Autoboxing, Annotations, Generics.

#### **UNIT -IV:**

**Event Handling:** Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.

The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

#### **UNIT -V:**

**Applets:** Concepts of Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.

**Swing:** Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- JApplet, JFrame and JComponent, Icons and Labels, Text Fields, Buttons – The JButton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

#### **TEXT BOOKS:**

1. Java the Complete Reference, 7th Edition, Herbert Schildt, TMH.
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education.

#### **REFERENCE BOOKS:**

1. An Introduction to Programming and OO Design using Java, J.Nino and F.A. Hosch, John Wiley & Sons.
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.
3. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
4. An Introduction to Java Programming and Object Oriented Application Development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, eighth Edition, Pearson Education

**Expected Outcome:**

The student is expected to have

- Understanding of OOP concepts and basics of java programming (Console and GUI based)
- The skills to apply OOP and Java programming in problem solving
- Should have the ability to extend his knowledge of Java programming further on his/her own.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70447) TELEVISION ENGINEERING****(Elective-II)****Course Objectives:**

The objectives of the course are:

- To familiarize the students with Television transmitters and receivers and TV signal transmission.
- To make them understand different signal processing steps monochrome television.
- To introduce colour television transmitters and receivers.

**UNIT –I:**

**Introduction:** TV transmitter and receivers, synchronization. Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal, TV standards. Camera tubes: image Orthicon, Plumbicon, vidicon, silicon Diode Array vidicon, Comparison of camera tubes, Monochrome TV camera,

**TV Signal Transmission and Propagation:** Picture Signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW, TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

**UNIT –II:**

**Monochrome TV Receiver:** RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits, AGC, noise cancellation, video and inter carrier sound signal detection, vision IF subsystem of Black and White receivers, Receiver sound system: FM detection, FM Sound detectors, and typical applications.

**UNIT -III:**

**Sync Separation and Detection:** TV Receiver Tuners, Tuner operation, VHF and UHF tuners, digital tuning techniques, remote control of receiver functions. Sync Separation, AFC and Deflection **Oscillators:** Synchronous separation, k noise in sync pulses, separation of frame and line sync pulses. AFC, single ended AFC circuit, Deflection Oscillators, deflection drive ICs, Receiver Antennas, Picture Tubes,

**UNIT –IV:**

**Color Television:** Colour signal generation, additive colour mixing, video signals for colours, colour difference signals, encoding, Perception of

brightness and colours luminance signal, Encoding of colour difference signals, formation of chrominance signals, color cameras, Colour picture tubes.

**Color Signal Encoding and Decoding:** NTSC colour system PAL colour system, PAL encoder, PAL-D Decoder, chrome signal amplifiers, separation of U and V signals, colour burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, Indent and colour killer circuits, U & V demodulators.

#### **UNIT –V:**

**Color Receiver:** Introduction to colour receiver, Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Color, Phasors, synchronous demodulators, Sub carrier generation, raster circuits.

**Digital TV:** Introduction to Digital TV, Digital Satellite TV, Direct to Home Satellite TV, Digital TV Transmitter, Digital TV Receiver, Digital Terrestrial TV, LCD TV, LED TV, CCD Image Sensors, HDTV.

#### **TEXT BOOKS:**

1. Television and Video Engineering- A.M.Dhake, 2nd Edition.
2. Modern Television Practice – Principles, Technology and Service- R.R.Gallatin, New Age International Publication, 2002.
3. Monochrome and Colour TV- R.R. Gulati, New Age International Publication, 2002.

#### **REFERENCE BOOKS:**

1. Colour Television Theory and Practice-S.P.Bali, TMH, 1994.
2. Basic Television and Video Systems-B.Grob and C.E.Herndon, McGraw Hill, 1999.

#### **Course Outcomes:**

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

- Understand TV standards and picture tubes for monochrome TV.
- Distinguish between monochrome and colour Television transmitters and receivers.
- Analyze and Evaluate the NTSC and PAL colour systems.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70444) OPTICAL COMMUNICATIONS****(Elective-II)****Course Objectives:**

The objectives of the course are:

- To realize the significance of optical fibre communications.
- To understand the construction and characteristics of optical fibre cable.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To understand the design of optical systems and WDM.

**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, Vnumber, Mode Coupling, Step Index Fibers, Graded Index Fibers.

Single Mode Fibers- Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalcogenide Glass, Plastic Optical Fibers.

**UNIT -II:**

**Signal Distortion in Optical Fibers:** Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

**UNIT -III:**

**Fiber Splicing:** Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints, Optical Sources- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

**Source to Fiber Power Launching:** - Output Patterns, Power Coupling,

Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

#### **UNIT -IV:**

**Optical Detectors:** Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation- Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

#### **UNIT -V:**

**Optical System Design:** Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples.

Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

#### **TEXT BOOKS:**

1. Optical Fiber Communications – Gerd Keiser, TMH, 4th Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition, 2009.

#### **REFERENCE BOOKS:**

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Introduction to Fiber Optics by Donald J. Sterling Jr. – Cengage learning, 2004.
5. Optical Communication Systems – John Gower, 2nd Edition, PHI, 2001.

#### **Course Outcomes:**

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

- Understand and analyze the constructional parameters of optical fibres.
- Be able to design an optical system.
- Estimate the losses due to attenuation, absorption, scattering and bending.
- Compare various optical detectors and choose suitable one for different applications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****4 -/- 4****(A70440) EMBEDDED SYSTEMS DESIGN****(Elective – II)****Course Objectives:**

For embedded systems, the course will enable the students to:

- Understand the basics of an embedded system
- Program an embedded system
- To learn the method of designing an Embedded System for any type of applications.
- To understand operating systems concepts, types and choosing RTOS.
- Design, implement and test an embedded system.

**UNIT -I:**

**Introduction to Embedded Systems:** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

**UNIT -II:**

**Typical Embedded System:** Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

**UNIT -III:**

**Embedded Firmware:** Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

**UNIT -IV:**

**RTOS Based Embedded System Design:** Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

**UNIT -V:**

**Task Communication:** Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques, Device Drivers,



How to Choose an RTOS.

**TEXT BOOK:**

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

**REFERENCE BOOKS:**

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

**Course Outcomes:**

Upon completion of this course, the student will be able to:

- Understand and design embedded systems.
- Learn basic of OS and RTOS
- Understand types of memory and interfacing to external world.
- Understand embedded firmware design approaches

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****- -/3/- 2****(A70086) ADVANCED COMMUNICATION SKILLS (ACS) LAB****Introduction**

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

**Objectives:**

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

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**Syllabus:**

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and

Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing – planning for writing – improving one's writing.
4. Activities on Presentation Skills – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

**Minimum Requirement:**

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

**Prescribed Lab Manual:** A book titled A Course Book of Advanced Communication Skills (ACS) Lab published by Universities Press, Hyderabad.

**Suggested Software:**

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- The following software from 'train2success.com'
  - Ø Preparing for being Interviewed
  - Ø Positive Thinking
  - Ø Interviewing Skills
  - Ø Telephone Skills
  - Ø Time Management

**Books Recommended:**

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
4. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
5. The Basics of Communication: A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
6. English Vocabulary in Use series, Cambridge University Press 2008.
7. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
8. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. Handbook for Technical Writing by David A McMurrey & Joanne Buckley CENGAGE Learning 2008.

11. Job Hunting by Colm Downes, Cambridge University Press 2008.
12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.
14. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/ Cambridge University Press.
15. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

#### **DISTRIBUTION AND WEIGHTAGE OF MARKS:**

Advanced Communication Skills Lab Practicals:

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

**Mini Project:** As a part of Internal Evaluation

1. Seminar/ Professional Presentation
2. A Report on the same has to be prepared and presented.
  - Teachers may use their discretion to choose topics relevant and suitable to the needs of students.
  - Not more than two students to work on each mini project.
  - Students may be assessed by their performance both in oral presentation and written report.

#### **Outcomes**

- Accomplishment of sound vocabulary and its proper use contextually.
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-I Sem****L T/P/D C****- -/3/- 2****(A70499) MICROWAVE ENGINEERING AND DIGITAL COMMUNICATIONS LAB**

Note: Minimum 12 Experiments to be conducted

**Part – A:** Microwave Engineering Lab (Any 6 Experiments):

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement
5. Measurement of Waveguide Parameters
6. Measurement of Impedance of a given Load
7. Measurement of Scattering parameters of a Magic Tee
8. Measurement of Scattering parameters of a Circulator
9. Attenuation Measurement
10. Microwave Frequency Measurement

**Part – B:** Digital Communication Lab (Any 6 Experiments):

1. PCM Generation and Detection
2. Differential Pulse Code Modulation
3. Delta Modulation
4. Time Division Multiplexing of 2 Band Limited Signals
5. Frequency shift keying: Generation and Detection
6. Phase Shift Keying: Generation and Detection
7. Amplitude Shift Keying: Generation and Detection
8. Study of the spectral characteristics of PAM, QAM
9. DPSK :Generation and Detection
10. QPSK : Generation and Detection

**Equipment required for the Laboratory:****Microwave Engineering Lab:**

1. Microwave Bench set up with Klystron Power Supply
2. Microwave Bench set up with Gunn Power Supply
3. Micro Ammeter
4. VSWR meter

5. Microwave Components

**Digital Communication Lab:**

1. RPS: 0-30V
2. CRO: 0-20MHz
3. Function Generators: 0-1MHz
4. RF Generators: 0-100MHz
5. Experimental Kits /Modules

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A80452) SATELLITE COMMUNICATIONS****(Elective –III)****Course Objectives:**

The course objectives are:

- To prepare students to excel in basic knowledge of satellite communication principles
- To provide students with solid foundation in orbital mechanics and launches for the satellite communication
- To train the students with a basic knowledge of link design of satellite with a design examples.
- To provide better understanding of multiple access systems and earth station technology
- To prepare students with knowledge in satellite navigation and GPS & and satellite packet communications

**UNIT -I:**

**Communication Satellite:** Orbit and Description: A Brief history of satellite Communication, Satellite Frequency Bands, Satellite Systems, Applications, Orbital Period and Velocity, effects of Orbital Inclination, Azimuth and Elevation, Coverage angle and slant Range, Eclipse, Orbital Perturbations, Placement of a Satellite in a Geo-Stationary orbit.

**UNIT -II:**

**Satellite Sub-Systems:** Attitude and Orbit Control system, TT&C subsystem, Attitude Control subsystem, Power systems, Communication subsystems, Satellite Antenna Equipment.

**Satellite Link:** Basic Transmission Theory, System Noise Temperature and G/T ratio, Basic Link Analysis, Interference Analysis, Design of satellite Links for a specified C/N, (With and without frequency Re-use), Link Budget.

**UNIT -III:**

**Propagation effects:** Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Scintillation and Low angle fading, Rain induced attenuation, rain induced cross polarization interference.



**Multiple Access:** Frequency Division Multiple Access (FDMA) - Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA) - Frame Structure, Burst Structure, Satellite Switched TDMA, On-board Processing, Demand Assignment Multiple Access (DAMA) – Types of Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception.

#### **UNIT -IV:**

**Earth Station Technology:** Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Power Test Methods, Lower Orbit Considerations.

**Satellite Navigation and Global Positioning Systems:** Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers, GPS C/A Code Accuracy, Differential GPS.

#### **UNIT -V:**

**Satellite Packet Communications:** Message Transmission by FDMA: M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.

#### **TEXT BOOKS:**

1. Satellite Communications –Timothy Pratt, Charles Bostian, Jeremy Allnutt, 2nd Edition, 2003, John Wiley & Sons.
2. Satellite Communications Engineering – Wilbur, L. Pritchard, Robert A. Nelson and Heuri G. Suyderhoud, 2nd Ed., Pearson Publications.
3. Digital Satellite Communications-Tri.T.Ha, 2nd Edition, 1990, Mc.Graw Hill.

#### **REFERENCE BOOKS:**

1. Satellite Communications-Dennis Roddy, 2nd Edition, 1996, McGraw Hill.
2. Satellite Communications: Design Principles – M. Richcharia, 2nd Ed., BSP, 2003.
3. Digital Satellite Communications – Tri. T. Ha, 2nd Ed., MGH, 1990.
4. Fundamentals of Satellite Communications – K. N. Raja Rao, PHI, 2004.

#### **Course Outcomes:**

At the end of the course,

- Students will understand the historical background, basic concepts

and frequency allocations for satellite communication

- Students will demonstrate orbital mechanics, launch vehicles and launchers
- Students will demonstrate the design of satellite links for specified C/N with system design examples.
- Students will be able to visualize satellite sub systems like Telemetry, tracking, command and monitoring power systems etc.
- Students will understand the various multiple access systems for satellite communication systems and satellite packet communications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A81102) BIOMEDICAL INSTRUMENTATION****(Elective–III)****Course Objectives:**

The following are the course objectives:

- To study bioamplifier, biosignals and measurement of physiological parameters.
- To know about different bioelectrodes and activities of heart.
- To understand therapeutic and cardiac instrumentation.
- To study EEG and EMG machines, recordings and interpretations.

**UNIT -I:**

**Components of Medical Instrumentation System:** Bioamplifier, Static and Dynamic Characteristics of Medical Instruments, Biosignals and Characteristics, Problems encountered with Measurements from Human beings.

Organization of Cell, Derivation of Nernst equation for Membrane Resting Potential Generation and Propagation of Action Potential, Conduction through Nerve to Neuromuscular Junction.

**UNIT -II:**

**Bio Electrodes:** Biopotential Electrodes-External Electrodes, Internal Electrodes, Biochemical Electrodes.

Mechanical Function, Electrical Conduction System of the Heart, Cardiac Cycle, Relation between Electrical and Mechanical Activities of the Heart.

**UNIT -III:**

**Cardiac Instrumentation:** Blood Pressure and Blood Flow Measurement, Specification of ECG Machine, Einthoven Triangle, Standard 12-Lead Configurations, Interpretation of ECG waveform with respect to Electro Mechanical Activity of the Heart.

**UNIT -IV:**

**Therapeutic Equipment:** Pacemaker, Defibrillator, Shortwave Diathermy, Hemodialysis Machine.

**Respiratory Instrumentation:** Mechanism of Respiration, Spirometry, Pneumotachograph Ventilators.

**UNIT -V:**

**Neuro-Muscular Instrumentation:** Specification of EEG and EMG

Machines, Electrode Placement for EEG and EMG Recording, Interpretation of EEG and EMG.

**TEXT BOOKS:**

1. Biomedical Instrumentation and Measurements – by Leslie Cromwell, F.J. Weibell, E.A. Pfeiffer, PHI.
2. Medical Instrumentation, Application and Design – by John G. Webster, John Wiley.

**REFERENCE BOOKS:**

1. Principles of Applied Biomedical Instrumentation – by L.A. Geoddes and L.E. Baker, John Wiley and Sons.
2. Hand-book of Biomedical Instrumentation – by R.S. Khandpur, McGraw-Hill, 2003.
3. Biomedical Telemetry – by Mackay, Stuart R., John Wiley.

**Course Outcomes:**

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

- The concept of biomedical instrumentation.
- Understand bioelectrodes and activities of heart.
- Analyse ECG, EEG and EMG recordings for disorder identification.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A80527) ARTIFICIAL NEURAL NETWORKS****(Elective-III)****Course Objectives:**

The objectives of this course are to:

- Understand the basic building blocks of artificial neural networks (ANNs)
- Understand the role of neural networks in engineering and artificial intelligence modelling
- Provide knowledge of supervised/unsupervised learning in neural networks
- Provide knowledge of single layer and multilayer perceptrons.
- To know about self-organizational maps and Hopfield models.

**UNIT -I:**

**Introduction:** A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

**Learning Process:** Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

**UNIT -II:**

**Single Layer Perceptrons:** Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

**Multilayer Perceptron:** Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

**UNIT -III:**

**Back Propagation:** Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

**UNIT -IV:**

**Self-Organization Maps (SOM):** Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer

Simulations, Learning Vector Quantization, Adaptive Patter Classification

**UNIT -V:**

**Neuro Dynamics:** Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models, Computer Experiment

**TEXT BOOK:**

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

**REFERENCE BOOKS:**

1. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005
2. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

**Course Outcomes:**

After the course the student should be able to:

- Explain the function of artificial neural networks of the Back-prop, Hopfield and SOM type
- Explain the difference between supervised and unsupervised learning
- Describe the assumptions behind, and the derivations of the ANN algorithms dealt with in the course
- Give example of design and implementation for small problems
- Implement ANN algorithms to achieve signal processing, optimization, classification and process modeling

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4**

**(A80431) TELECOMMUNICATION SWITCHING SYSTEMS AND  
NETWORKS  
(Elective-IV)**

**Course objectives:**

The following are the course objectives:

- To learn Switching, Signaling and traffic in the context of telecommunication network.
- To expose through the evolution of switching systems from manual and electromechanical systems to stored-program-controlled digital systems.
- To study signaling, packet switching and networks.

**UNIT -I:**

**Switching Systems:** Evolution of Telecommunications; Basics of a Switching System; Functions of a Switching System; Crossbar Switching-Principle of Crossbar Switching; Crossbar Switch Configurations; Cross-Point Technology; Crossbar Exchange Organization; A General Trunking; Electronic Switching; Digital Switching Systems.

**Telecommunications Traffic:** Introduction; The Unit of Traffic; Congestion; Traffic Measurement; A Mathematical Model; Lost-Call Systems-Theory; Traffic Performance; Loss Systems in Tandem; Use of Traffic Tables; Queuing Systems-The Second Erlang Distribution; Probability of Delay; Finite Queue Capacity; Some Other Useful Results; Systems with a Single Server; Queues in Tandem; Delay Tables; Applications of Delay Formulae.

**UNIT -II:**

**Switching Networks:** Single Stage Networks; Gradings-Principle; Two Stage Networks; Three Stage Networks; Four Stage Networks

**Time Division Switching:** Basic Time Division Space Switching; Basic Time Division Time Switching; Time Multiplexed Space Switching; Time Multiplexed Time Switching; Combination Switching; Three Stage Combination Switching.

**Control of Switching Systems:** Call Processing Functions-Sequence of Operations; Signal Exchanges; State Transition Diagrams; Common Control; Reliability; Availability and Security; Stored Program Control.

**UNIT -III:**

**Signaling:** Introduction; Customer Line Signaling; Audio Frequency Junctions and Trunk Circuits; FDM Carrier Systems-Outband Signaling; Inband (VF)

Signaling; PCM Signaling; Inter Register Signaling; Common Channel Signaling Principles-General Signaling Networks; CCITT Signaling System Number 6; CCITT Signaling System Number 7; The High Level Data Link Control Protocol; Signal Units; The Signaling Information Field.

#### **UNIT -IV:**

**Packet Switching:** Introduction; Statistical Multiplexing; Local Area And Wide Area Networks-Bus Networks; Ring Networks; Comparison of Bus and Ring Networks; Optical Fiber Networks; Large Scale Networks-General; Datagrams and Virtual Circuits; Routing; Flow Control; Standards; Frame Relay; Broadband Networks-General; The Asynchronous Transfer Mode; ATM Switches.

#### **UNIT -V:**

**Networks:** Introduction; Analog Networks; Integrated Digital Networks; Integrated Services Digital Networks; Cellular Radio Networks; Intelligent Networks; Private Networks; Charging; Routing – General, Automatic Alternative Routing.

#### **TEXT BOOKS:**

1. J. E Flood, "Telecommunications Switching and Traffic Networks," Pearson Education, 2006.
2. Tyagarajan Viswanathan, "Telecommunications Switching Systems and Networks," Prentice Hall of India Pvt. Ltd., 2006.

#### **REFERENCE BOOKS:**

1. John C Bellamy, "Digital Telephony," John Wiley International Student Edition, 3rd Edition, 2000.
2. Behrouz A. Forouzan, "Data Communications and Networking," TMH, 2nd Edition, 2002.
3. Tomasi, "Introduction to Data Communication and Networking," Pearson Education, 1st Edition, 2007.

#### **Course outcomes:**

On completion of this course, it is expected that the student will be able to:

- Understand the main concepts of telecommunication network design
- Analyze and evaluate fundamental telecommunication traffic models.
- Understand basic modern signaling system.
- Solve traditional interconnection switching system design problems.
- Understand the concept of packet switching



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A80450) RADAR SYSTEMS****(Elective-IV)****Course Objectives:**

The objectives of the course are:

- Radar fundamentals and analysis of the radar signals.
- To understand various technologies involved in the design of radar transmitters and receivers.
- To learn various radars like MTI, Doppler and tracking radars and their comparison.

**UNIT –I:**

**Basics of Radar :** Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.

**Radar Equation :** SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

**UNIT –II:**

**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. Illustrative Problems

**FM-CW Radar:** Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

**UNIT -III:**

**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, MTI versus Pulse Doppler Radar.

**UNIT –IV:**

**Tracking Radar:** Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and

two- coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

#### **UNIT –V:**

**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.

**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, Applications, Advantages and Limitations.

#### **TEXT BOOK:**

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.

#### **REFERENCE BOOKS:**

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013

#### **Course Outcomes:**

After completion of the course, the student will be able to:

- Understand radar fundamentals and analysis of the radar signals.
- Understand various radar transmitters and receivers.
- Understand various radars like MTI, Doppler and tracking radars and their comparison.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A80449) NETWORK SECURITY****(Elective-IV)****Course Objectives:**

The main objectives are:

- To acquire an understanding of network security and its changing character.
- To understand how network security is conceptualized and carried out.
- To examine conventional encryption and cryptography techniques.
- To articulate informed opinion about issues related to network IP security.
- To identify and investigate web security requirements.
- To appreciate the concepts of SNMP and design principles of firewall.

**UNIT –I:**

**Security Attacks:** (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

**UNIT –II:**

**Conventional Encryption:** Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

**UNIT –III:**

**Public Key Cryptography:** principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

**Email Privacy:** Pretty Good Privacy (PGP) and S/MIME.

**UNIT –IV:**

**IP Security:** Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**Web Security Requirements:** Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

**UNIT –V:**

**Basic Concepts of SNMP:** SNMPv1 Community facility and SNMPv3, Intruders, Viruses and related threats.

**Firewall:** Design principles, Trusted Systems, Intrusion Detection Systems.

**TEXT BOOKS:**

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permech, wiley Dreamtech

**REFERENCE BOOKS:**

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Cryptography and network Security, Third Edition, Stallings, PHI/ Pearson
4. Principles of Information Security, Whitman, Thomson.
5. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
6. Introduction to Cryptography, Buchmann, Springer.
7. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.
8. Information Systems Security, Godbole, Wiley Student Edition.
9. Cryptography and network Security, B.A.Forouzan, D.Mukhopadhyay, 2nd Edition, TMH.

**Course Outcomes:**

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

- Acquire an understanding of network security and its changing character.
- Understand conventional encryption and cryptography techniques.
- Analyze issues related to network IP security.
- Identify and investigate web security requirements.
- Know the concepts of SNMP and design principles of firewall.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A80454) WIRELESS COMMUNICATIONS AND NETWORKS****(Elective-V)****Course objectives:**

The course objectives are:

- To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
- To equip the students with various kinds of wireless networks and its operations.
- To prepare students to understand the concept of frequency reuse, and be able to apply it in the design of mobile cellular system.
- To prepare students to understand various modulation schemes and multiple access techniques that are used in wireless communications,
- To provide an analytical perspective on the design and analysis of the traditional and emerging wireless networks, and to discuss the nature of, and solution methods to, the fundamental problems in wireless networking.
- To train students to understand the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.
- To train students to understand wireless LAN architectures and operation.
- To prepare students to understand the emerging technique OFDM and its importance in the wireless communications.

**UNIT -I:**

**The Cellular Concept-System Design Fundamentals:** Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies-Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

**UNIT –II:**

**Mobile Radio Propagation: Large-Scale Path Loss:** Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to

Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryze Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

#### **UNIT –III:**

**Mobile Radio Propagation: Small –Scale Fading and Multipath:** Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

#### **UNIT -IV:**

**Equalization and Diversity:** Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

#### **UNIT -V:**

**Wireless Networks:** Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison

of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

**TEXT BOOKS:**

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

**REFERENCE BOOKS:**

1. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – Upen Dalal, Oxford Univ. Press
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

**Course Outcomes:**

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

- Understand the principles of wireless communications.
- Understand fundamentals of wireless networking
- Understand cellular system design concepts.
- Analyze various multiple access schemes used in wireless communication.
- Understand wireless wide area networks and their performance analysis.
- Demonstrate wireless local area networks and their specifications.
- Familiar with some of the existing and emerging wireless standards.
- Understand the concept of orthogonal frequency division multiplexing.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A80437) DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES****(Elective – V)****Course Objectives:**

The objectives of the course are:

- To recall digital transform techniques.
- To introduce architectural features of programmable DSP Processors of TI and Analog Devices..
- To give practical examples of DSP Processor architectures for better understanding.
- To develop the programing knowledge using Instruction set of DSP Processors.
- To understand interfacing techniques to memory and I/O devices.

**UNIT –I:**

**Introduction to Digital Signal Processing:** Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

**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 –II:**

**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 -III:**

**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 –IV:**

**Analog Devices Family of DSP Devices:** Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

#### **UNIT –V:**

**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).

#### **TEXT BOOKS:**

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

#### **REFERENCE BOOKS:**

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
5. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997

6. Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes , ISBN 0750679123, 2005.

**Course Outcomes:**

Upon completion of the course, the student

- Be able to distinguish between the architectural features of General purpose processors and DSP processors.
- Understand the architectures of TMS320C54xx and ADSP 2100 DSP devices.
- Be able to write simple assembly language programs using instruction set of TMS320C54xx.
- Can interface various devices to DSP Processors.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. ECE-II Sem****L T/P/D C****4 -/- 4****(A80451) RF CIRCUIT DESIGN****(Elective-V)****Course Objectives:**

The course objectives are:

- To educate students fundamental RF circuit and system design skills.
- To introduce students the basic transmission line theory, single and multiport networks, RF component modelling.
- To offer students experience on designing matching and biasing networks & RF transistor amplifier design.

**UNIT -I:**

**Introduction:** Importance of RF Design-Dimensions and Units-Frequency Spectrum-RF Behavior of Passive Components: High Frequency Resistors, High Frequency Capacitors, High Frequency Inductors.-Chip Components and Circuit Board Considerations: Chip Resistors, Chip Capacitors, and Surface Mount Inductors.

**Review of Transmission Lines:** Types of Transmission Lines-Equivalent Circuit representation-R, L, C, G parameters of Different Line configurations-Terminated Lossless Transmission Lines-Special Terminations: Short Circuit, Open Circuit and Quarter Wave Transmission Lines- Sourced and Loaded Transmission Lines: Power Considerations, Input Impedance Matching, Return Loss and Insertion Loss.

**UNIT -II:**

**Single and Multi-Port Networks:** The Smith Chart: Reflection Coefficient, Normalized Impedance-Impedance Transformation: Standing wave Ratio, Special Transformation Conditions-Admittance Transformation-Parallel and Series RL & RC Connections-Basic Definitions of Single and Multi-Port Networks-Interconnecting Networks.

**RF Filter Design:** Scattering Parameters: Definition, Meaning, Chain Scattering Matrix, Conversion Between S- and Z-parameters, Signal Flow Chart Modeling, Generalization-Basic Resonator and Filter Configurations: Low Pass, High Pass, Band Pass and Band Stop type Filters-Filter Implementation using Unit Element and Kuroda's Identities Transformations-Coupled Filters.

**UNIT -III:**

**Active RF Component Modelling:** RF Diode Models: Nonlinear and Linear Models-Transistor Models: Large Signal and Small Signal BJT Models, Large Signal and Small Signal FET Models- Scattering Parameter, Device Characterization.

**UNIT -IV:**

**Matching and Biasing Networks:** Impedance Matching Using Discrete Components: Two Component Matching Networks, Forbidden Regions, Frequency Response and Quality Factor, T and Pi Matching Networks-Amplifier Classes of Operation and Biasing Networks: Classes of Operation and Efficiency of Amplifiers, Biasing Networks for BJT, Biasing Networks for FET.

**UNIT -V:**

**RF Transistor Amplifier Design:** Characteristics of Amplifiers- Amplifier Power Relations: RF Source, Transducer Power Gain, Additional Power Relations-Stability Considerations: Stability Circles, Unconditional Stability, And Stabilization Methods-Unilateral and Bilateral Design for Constant Gain-Noise Figure Circles- Constant VSWR Circles.

**RF Oscillators and Mixers:** Basic Oscillator Model: Negative Resistance Oscillator, Feedback Oscillator Design, Design steps, Quartz Oscillators-Fixed Frequency High Frequency Oscillator -Basic Characteristics of Mixers: Concepts, Frequency Domain Considerations, Single Ended Mixer Design, Single and Double Balanced Mixers.

**TEXT BOOKS:**

1. RF Circuit Design – Theory and Applications - Reinhold Ludwig, Pavel Bsetchko – Pearson Education India, 2000.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design - Devendra K.Misra – Wiley Student Edition – John Wiley & Sons, Inc.

**REFERENCE BOOKS:**

1. Radio Frequency and Microwave Electronics – Matthew M. Radmanesh – PEI.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Circuit Design - Joseph J.Carr, TMH, 2000.
4. Design of RF and Microwave Amplifiers and Oscillators - Peter L.D. Abrif, Artech House, 2000.

5. The Design of CMOS Radio Frequency Integrated Circuits - Thomas H.Lee , 2/e – Cambridge University Press, 2004.

**Course Outcomes:**

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

- Explore fundamental RF circuit and system design skills.
- Understand the basic transmission line theory, single and multiport networks, RF component modelling.
- Design matching and biasing networks & RF transistor amplifiers.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. ECE-II Sem	L	T/P/D	C
	-	-/-/-	2
<b>(A80087) INDUSTRY ORIENTED MINI PROJECT</b>			

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. ECE-II Sem	L	T/P/D	C
	-	-/6/-	2
<b>(A80089) SEMINAR</b>			

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. ECE-II Sem	L	T/P/D	C
	-	-/15/-	10
<b>(A80088) MAJOR PROJECT</b>			

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. ECE-II Sem	L	T/P/D	C
	-	-/-/-	2
<b>(A80090) COMPREHENSIVE VIVA</b>			