

SHADAN WOMEN'S COLLEGE OF ENGINEERING AND TECHNOLOGY

Khairatabad, Hyderabad

(An Autonomous Institution)

B.Tech - ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE & SYLLABUS (R23 Regulations)

APPLICABLE FROM ACADEMIC YEAR 2023-24 BATCH

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA301BS	Numerical Methods and Complex Variables	3	1	0	4
2	EC302PC	Analog Circuits	3	0	0	3
3	EC303PC	Network analysis and Synthesis	3	0	0	3
4	EC304PC	Digital Logic Design	3	0	0	3
5	EC305PC	Signals and Systems	3	1	0	4
6	EC306PC	Analog Circuits Laboratory	0	0	2	1
7	EC307PC	Digital logic Design Laboratory	0	0	2	1
8	EC308PC	Basic Simulation Laboratory	0	0	2	1
9	*MC309	Constitution of India	3	0	0	0
		Total Credits	18	2	6	20

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC401PC	Probability Theory and Stochastic Processes	3	0	0	3
2	EC402PC	Electromagnetic Fields and Transmission Lines	3	0	0	3
3	EC403PC	Analog and Digital Communications	3	0	0	3
4	EC404PC	Linear and Digital IC Applications	3	0	0	3
5	EC405PC	Electronic Circuit Analysis	3	0	0	3
6	EC406PC	Analog and Digital Communications Laboratory	0	0	2	1
7	EC407PC	Linear and Digital IC Applications Laboratory	0	0	2	1
8	EC408PC	Electronic Circuit Analysis Laboratory	0	0	2	1
9	EC409PC	Real Time Project/ Field Based Project	0	0	4	2
10	*MC410	Gender Sensitization Lab	0	0	2	0
		Total Credits	15	0	12	20

III YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC501PC	Microcontrollers	3	1	0	4
2	EC502PC	IoT Architectures and Protocols	3	0	0	3
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	Microcontrollers Laboratory	0	0	2	1
7	EC506PC	IoT Architectures and Protocols Laboratory	0	0	2	1
8	EN508HS	Advanced English Communication Skills Laboratory	0	0	2	1
9	*MC510	Intellectual Property Rights	3	0	0	0
		Total Credits	18	2	6	20

III YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	EC601PC	Antennas and Wave Propagation	3	0	0	3
2	EC602PC	Digital Signal Processing	3	0	0	3
3	EC603PC	CMOS VLSI Design	3	0	0	3
4		Professional Elective - II	3	0	0	3
5		Open Elective – I	3	0	0	3
6	EC604PC	Digital Signal Processing Laboratory	0	0	2	1
7	EC605PC	CMOS VLSI Design Laboratory	0	0	2	1
8	EC606PC	Advanced Communication Laboratory	0	0	2	1
9	EC607PC	Industry Oriented Mini Project/ Internship	0	0	4	2
10	*MC609	Environmental Science	3	0	0	0
		Total Credits	18	0	10	20

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.

Professional Elective – I

EC511PE	Computer Organization & Operating Systems
EC512PE	Data Communications and Computer Networks
EC513PE	Electronic Measurements and Instrumentation

Professional Elective – II

EC621PE	Digital Image Processing
EC622PE	Mobile Communications and Networks
EC623PE	Embedded System Design

Open Electives

Open Elective (OE – I)
1. Fundamentals of Internet of Things
2. Principles of Signal Processing
3. Digital Electronics for Engineering

MA301BS: NUMERICAL METHODS AND COMPLEX VARIABLES**B.Tech. II Year I Sem.****L T P C****3 0 0 3****Pre-requisites: Mathematics courses of first year of study.****Course Objectives: To learn**

- Expressing periodic function by Fourier series and a non-periodic function by Fourier transforms
- Various numerical methods to find roots of polynomial and transcendental equations.
- 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 of first order 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

- Express any periodic function in terms of sine and cosine
- Find the root of a given polynomial and transcendental equations.
- Estimate the value for the given data using interpolation
- Find the numerical solutions for a given first order 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 in complex function

UNIT-I: Fourier Series & Fourier Transforms:**10 L**

Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sine and cosine transforms - Inverse Fourier transforms, finite Fourier Transforms.

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**8 L**

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8th rules. Ordinary differential equations: Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order for first order ODE

UNIT-IV: Complex 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. (All theorems without Proofs), Conformal mappings, Mobius transformations.

UNIT-V: Complex Integration:**10 L**

Line integrals, Cauchy's theorem, Cauchy's Integral formula, zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem. and their properties. (All theorems without Proofs)

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

REFERENCE BOOKS:

1. M. K. Jain, S.R.K. 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.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, MacGraw Hill.

EC302PC: ANALOG CIRCUITS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

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

1. Learn the concepts of, load line analysis and biasing techniques
2. Learn the concepts of high frequency analysis of transistors.
3. To give understanding of various types of amplifier circuits
4. Learn the concepts of small signal analysis of BJT and FET
5. To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.

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

1. Design the amplifiers with various biasing techniques.
2. Design single stage amplifiers using BJT and FET
3. Design multistage amplifiers and understand the concepts of High Frequency Analysis of BJT.
4. Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to sustained oscillations.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	-	-	-	-	-	-	-	1
CO2	2	3	3	2	-	-	-	-	-	-	-	1
CO	2	3	3	2	-	-	-	-	-	-	-	1
CO4	2	3	3	2	-	-	-	-	-	-	-	1

UNIT - I

BJT Biasing: Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diode

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 - II

FET- Biasing Techniques

FET Amplifiers: Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOSFET Amplifiers, 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

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

Transistor at High Frequency: Hybrid π model of Common Emitter transistor model, f_α , f_β and unity gain bandwidth, Gain-bandwidth product.

UNIT - IV

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 - V

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.

TEXT BOOKS:

1. Jacob Millman, Christos C Halkias -Integrated Electronics, McGraw Hill Education.
2. Robert L. Boylestead, Louis Nashelsky -Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson

REFERENCE BOOKS:

1. David A. Bell – Electronic Devices and Circuits, 5th Edition, Oxford.
2. Adel S. Sedra, Kenneth C. Smith- Microelectronic Circuits- Theory and Applications, Oxford.
3. Chinmoy Saha, Arindam Halder, Debaati Ganguly -Basic Electronics-Principles and Applications, 2018, Cambridge.

EC303PC: NETWORK ANALYSIS AND SYNTHESIS**B.Tech. II Year I Sem.****L T P C**
3 0 0 3**Course Objectives:**

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady state and transient states in RLC circuits.
3. To understand the two port network parameters.
4. Learn the design concepts of various filters and attenuators

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

1. Gain the knowledge on basic RLC circuits behaviour.
2. Analyse the Steady state and transient analysis of RLC Circuits.
3. Characterization of two port network parameters.
4. Analyse the Design aspect of various filters and attenuators

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	1	-	-	-	-	1
CO2	2	3	2	-	-	-	1	-	-	-	-	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1
CO4	2	3	3	-	-	-	1	-	-	-	-	1

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: RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. RC Circuits as integrator and differentiators. 2nd 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, π , L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

UNIT-IV

Filters: Classification of Filters, Filter Networks, Constant-K Filters-Low pass, high pass, Band pass, band-stop filters, M-derived Filters- T and π filters- Low pass, high pass

Attenuators: Types – T, π , L, Bridge T and lattice, Asymmetrical Attenuators T, π , L Equalizers-Types- Series, Shunt, Constant resistance, bridge T attenuation, bridge T phase, Lattice

attenuation, lattice Phase equalizers

UNIT – V

Network Synthesis: Driving point impedance and admittance, transfer impedance and admittance, network functions of Ladder and non ladder networks, Poles, Zeros analysis of network functions, Hurwitz polynomials, Positive Real Functions, synthesis of LC, RC and RL Functions by foster andcauser methods.

TEXT BOOKS:

1. Van Valkenburg -Network Analysis, 3rd Ed., Pearson, 216.
2. JD Ryder - Networks, Lines and Fields, 2nd Ed., PHI, 1999.

REFERENCE BOOKS:

1. J. Edminister and M. Nahvi - Electric Circuits, Schaum's Outlines, Mc Graw Hills Education, 1999.
2. A. Sudhakar and Shyammohan S Palli - Networks & Circuits, 4th Ed., Tata McGraw- Hill Publications
3. William Hayt and Jack E. Kimmerley - Engineering Circuit Analysis, 6th Ed., William Hayt and Jack E. Kimmerley, McGraw Hill Company

EC304PC: DIGITAL LOGIC DESIGN

B.Tech. II Year I Sem.

L T P C**3 0 0 3****Course Objectives:**

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

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

1. Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems.
2. Define Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.
3. Design and analyse sequential circuits for various cyclic functions.
4. Characterize logic families and analyze them for the purpose of AC and DC parameters.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2	1	-	-	-	-	-	2
CO2	3	2	2	1	2	1	-	-	-	-	-	2
CO3	2	3	3	2	2	1	-	-	-	-	-	1
CO4	3	2	1	1	1	-	-	-	-	-	-	-

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

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, standard TTL NAND Gate-Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri-state outputs, IC interfacing- TTL driving CMOS & CMOS driving TTL.

UNIT – III

Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

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.

UNIT - IV

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.

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters.

UNIT – V

Finite state machine: capabilities and limitations, Mealy and Moore models, State equivalence and machine minimization, simplification of incompletely specified machines, Merger graphs. Asynchronous design-modes of operation, Hazards, synthesis of SIC fundamental mode circuits, synthesis of burst mode circuits. Introduction to ASM Charts

TEXT BOOKS

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

REFERENCE BOOKS

1. Morris Mano, Fredriac J. Hill, Gerald R. Peterson - Introduction to Switching Theory and Logic Design –3rd Ed., John Wiley & Sons Inc.
2. Charles H. Roth - Fundamentals of Logic Design, 5th ED., Cengage Learning, 2004.

EC305PC: SIGNALS AND SYSTEMS**B.Tech. II Year I Sem.**

L	T	P	C
3	1	0	4

Course Objectives: The objectives of this subject are to:

1. Classify signals and systems and their analysis in time and frequency domains.
2. Study the concepts of distortion less transmission through LTI systems, convolution and correlation properties.
3. Understand Laplace and Z-transforms their properties for analysis of signals and systems.
4. Identify the need for sampling of CT signals, types and merits and demerits of each type.

Course Outcomes: Upon completing this course the students able to:

1. Characterize various signals, systems and their time and frequency domain analysis, using transform techniques.
2. Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
3. Use sampling theorem for baseband and band pass signals for various types of sampling and for different duty cycles.
4. Apply the correlation and PSD functions for various applications.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	1
CO2	3	3	2	-	-	-	-	-	-	-	-	1
CO3	3	3	2	2	-	-	-	-	-	-	-	1
CO4	3	3	2	2	-	-	-	-	-	-	-	1

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

REFERENCE BOOKS

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

EC306PC: ANALOG CIRCUITS LABORATORY**B.Tech. II Year I Sem.**

L	T	P	C
0	0	2	1

Course Outcomes: Upon completing this course the students will be able to

1. Design amplifiers with required Q point and analyse amplifier characteristics
2. Examine the effect multistage amplification on frequency response
3. Investigate feedback concept in amplifiers and oscillator

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	2	-	3	-	-	3	3	-	-	1
CO2	1	-	2	-	3	-	-	3	3	-	-	1
CO3	1	-	2	-	3	-	-	3	3	-	-	1

List of Experiments (Twelve experiments to be done):

Verify any twelve experiments in H/W Laboratory

1. Perform an experiment to choose Q-point for a Transistor that operate in active region and observe the effect of external Load resistance on Q-point.
2. Design a Self bias Circuit and determine the Q-point of the Transistor and its Stability factor by both simulation and realization with hardware components.
3. Obtain the I/O Characteristics of CE, CB, CC amplifiers. Calculate h-parameters from the Characteristics.
4. Design and Simulate a Common Drain Amplifier with voltage divider bias and determine the Stability factor.
5. Obtain the Drain and Transfer characteristics of CD, CS amplifiers of JFET. Calculate gm, rd from the Characteristics.
6. By experiment prove that the voltage gain of Emitter Follower Circuit is one.
7. Design a Common Emitter Amplifier with a gain of 30db and Bandwidth of 10KHZ and plot the frequency response practically.
8. Design a two stage RC Coupled amplifier and prove that gain is increased and analyze the effects of coupling capacitance.
9. Practically prove that the Darlington pair has high input impedance.
10. Draw the high frequency response of common emitter transistor amplifier and calculate f_{α} , f_{β} and gain bandwidth product.
11. Design a cascode amplifier for a given specifications
12. Design four topologies of feedback amplifiers and draw the frequency response of them with and without feedback.
13. Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
14. Design a Colpitts oscillator circuit for the given frequency and draw the output waveform.

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 devices

EC307PC: DIGITAL LOGIC DESIGN LABORATORY**B.Tech. II Year I Sem.**

L	T	P	C
0	0	2	1

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

1. Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems.
2. Define Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.
3. Design and analyze sequential circuits for various cyclic functions.
4. Characterize logic families and analyze them for the purpose of AC and DC parameters.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2	1	-	-	1	-	-	2
CO2	3	2	2	1	2	1	-	-	1	-	-	2
CO3	2	3	3	2	2	1	-	-	1	-	-	1
CO4	3	2	1	1	1	-	-	-	-	-	-	-

List of Experiments

1. Realization of Logic circuit to generate r's Complement using Logic Gates.
2. Realization of given Boolean function using universal gates and minimizing the same. Compare the gate count before and after minimization.
3. Design and realize Full Adder circuit using gates/universal gates. Implement Full Subtractor using full adder.
4. Designing a 2 – bit Comparator using AND, OR and NOT gates. Realize 4 – bit Comparator using 2– bit Comparators.
5. Realize 2:1 MUX using the given gates and Design 8:1 using 2:1 MUX.
6. Implement the given Boolean function using the given MUX(ex: code converters).
7. Realize a 2x4 Decoder using logic gates and implement 3x8 Decoder using 2x4 Decoder.
8. Implement the given Boolean function using given Decoders.
9. Convert Demultiplexer to Decoder and vice versa.
10. Verification of truth tables of flipflops using different clocks (level triggering, positive and negative edge triggering) also converts the given flipflop from one type to other.
11. Designing of Universal n-bit shift register using flipflops and Multiplexers. Draw the timing diagram of the Shift Register.
12. Design a Synchronous binary counter using D-flipflop/given flipflop.
13. Design a asynchronous counter for the given sequence using given flipflops.
14. Designing of MOD 8 Counter using JK flipflops.
15. Designing of sequence detecting State Machine with minimal states using the given flipflops.
16. Designing of Parity Bit(even/odd) generator using the given flipflops.

17. Realize all logic gates with TTL logic.

18. Realize all logic gates with DTL logic.

*Design a sequence detector to detect a given sequence and verify practically

*Design a serial subtractor for 4 bit binary numbers

Major Equipment 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.

EC308PC: BASIC SIMULATION LABORATORY**B.Tech. II Year I Sem.****L T P C**
0 0 2 1**Course Outcomes:** Upon completing this course, the students will be able to

1. Generate, analyze and perform various operations on Signals/Sequences both in time and Frequency domain
2. Analyze and Characterize Continuous and Discrete Time Systems both in Time and Frequency domain along with the concept of Sampling
3. Generate different Random Signals and capable to analyze their Characteristics
4. Apply the Concepts of Deterministic and Random Signals for Noise removal Applications and on other Real Time Signals

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	2	-	-	3	1	-	1
CO2	3	2	3	3	3	2	-	-	3	1	-	1
CO3	3	2	3	3	3	2	-	-	3	1	-	1
CO4	3	2	3	3	3	2	-	-	3	1	-	1

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 Equipment 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

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- Discuss the passage of the Hindu Code Bill of 1956.

Unit - 1 History of Making of the Indian Constitution- History of Drafting Committee.

Unit - 2 Philosophy of the Indian Constitution- Preamble Salient Features

Unit - 3 Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit - 4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit - 5 Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat

raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit - 6 Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

EC401PC: PROBABILITY THEORY AND STOCHASTIC PROCESSES**B.Tech. II Year II Sem.****L T P C****3 0 0 3****Pre-requisite:** Mathematics**Course Objectives:**

1. This gives basic understanding of random variables and operations that can be performed on them.
2. To know the Spectral and temporal characteristics of Random Process.
3. To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

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

1. Perform operations on single and multiple Random variables.
2. Determine the Spectral and temporal characteristics of Random Signals.
3. Characterize LTI systems driven by stationary random process by using ACFs and PSDs.
4. Understand the concepts of Noise and Information theory in Communication systems.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1	3	3	-	2	-	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-

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. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles, 4th Ed, TMH, 2001.
2. Taub and Schilling - Principles of Communication systems, TMH, 2008

REFERENCE BOOKS:

1. Bruce Hajek - Random Processes for Engineers, Cambridge unipress, 2015
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002.
3. B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003.
4. S.P Eugene Xavier -Statistical Theory of Communication, New Age Publications, 2003

EC402PC: ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES**B.Tech. II Year II Sem.****L T P C****3 0 0 3****Pre-requisite:** Mathematics**Course Objectives:** Upon completing this course, the students will be able to

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve physics and engineering problems.
2. 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.
3. To study the propagation, reflection and transmission of planewaves in bounded and unbounded media.

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

1. Acquire the knowledge of Basic Laws, Concept and proofs related to Electrostatic Fields and Magneto static Fields.
2. Characterize the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions.
3. Analyze the Wave Equations and classify conductors, dielectrics and evaluate the UPW Characteristics for several practical media of interest.
4. Analyze the Design aspect of transmission line parameters and configurations.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	1	-	-	-	1	-	-
CO2	3	3	2	1	-	1	-	-	-	1	-	-
CO3	3	3	2	1	-	1	-	-	-	1	-	-
CO4	3	3	2	1	-	1	-	-	-	1	-	-

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, 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, 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 Two Equations for Magnetostatic Fields, Maxwell's Two Equations for Electrostatic Fields 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

Transmission Lines: 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, Condition for Distortionless line, Minimum Attenuation, Loading - Types of Loading, SC and OC Lines, $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines, Reflection Coefficient, VSWR Smith Chart — Configuration and Applications, Single Stub Matching.

TEXT BOOKS:

1. William H. Hayt Jr. and John A. Buck- Engineering Electromagnetics, 8th Ed., McGraw Hill, 2014
2. Matthew N.O. Sadiku and S.V. Kulkarni - Principles of Electromagnetics, 6th Ed., Oxford University Press, Aisan Edition, 2015.

REFERENCE BOOKS:

1. J.D. Kraus -Electromagnetics with Applications, 5th Ed., TMH
2. Umesh Sinha, Satya Prakashan -Transmission Lines and Networks, (Tech. India Publications), New Delhi, 2001.
3. J.D. Ryder -Networks, Lines and Fields, 2nd Ed., PHI, 1999

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

L	T	P	C
3	0	0	3

Prerequisite: Probability theory and Stochastic Processes, Signal and system**Course Objectives:**

1. To develop ability to analyze system requirements of Analog and digital communication systems.
2. To understand the generation, detection of various Analog and digital modulation techniques.
3. To acquire the vortical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of baseband transmissions.

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

1. Design and analyze various Analog and Digital Modulation and Demodulation techniques.
2. Model the noise present in continuous wave Modulation techniques.
3. Implement the Super heterodyne Receiver concept and Pulse Modulation Techniques invarious applications
4. Analyze and design the base band Transmission

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	-	3	2	-	-	-	-	1	2	2
CO2	3	3	3	1	-	2	2	-	-	-	-	1	2	2
CO3	3	3	3	1	-	2	2	-	-	-	-	1	2	2
CO4	3	3	3	1	-	3	2	-	-	-	-	1	2	2

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, Wideband 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, Super heterodyne 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, DifferentialPSK and QAM.

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

TEXT BOOKS

1. Simon Haykin -Analog and Digital Communications, John Wiley, 2005.
2. Wayne Tomasi - Electronics Communication Systems-Fundamentals through Advanced, 5thEd., PHI, 2009.

REFERENCE BOOKS

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

EC404PC: LINEAR AND DIGITAL IC APPLICATIONS**B.Tech. II Year II Sem.****L T P C****3 0 0 3****Course Objectives:** The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of Analog multipliers and PLL.
3. To introduce the concept sine waveform generation and introduce some special function ICs.
4. To understand and implement the working of basic digital circuits.

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

1. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Attain the knowledge of functional diagrams and design applications of IC555 and IC565.
3. Acquire the knowledge and design the Data converters.
4. Choose the proper digital integrated circuits by knowing their characteristics.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	-
CO2	3	3	3	1	-	-	-	-	-	-	-	-
CO3	3	3	3	1	-	-	-	-	-	-	-	-
CO4	3	3	2	1	-	-	-	-	-	-	-	-

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 & IC565 Applications: Introduction to Active Filters, Characteristics of Bandpass, Bandreject 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, principle and 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

Combinational Logic ICs: Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, 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 & CMOS40XX 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. Ramakanth A. Gayakwad - Op-Amps & Linear ICs, PHI, 2003.
2. Floyd and Jain- Digital Fundamentals, 8th Ed., Pearson Education, 2005.

REFERENCE BOOKS:

1. D. Roy Chowdhury – Linear Integrated Circuits, New Age International(p)Ltd, 2nd Ed., 2003.
2. John. F. Wakerly – Digital Design Principles and Practices, 3rd Ed., Pearson, 2009.
3. Salivahana -Linear Integrated Circuits and Applications, TMH, 2008.
4. William D. Stanley- Operational Amplifiers with Linear Integrated Circuits, 4th Ed., Pearson Education India, 2009.

EC405PC: ELECTRONIC CIRCUIT ANALYSIS**B.Tech. II Year II Sem.****L T P C****3 0 0 3****Pre-requisite:** Analog Circuits**Course Objectives:** Upon completing this course, the student will be able to

1. Learn the concepts of Power Amplifiers.
2. To give understanding of tuned amplifier circuits
3. Understand various multivibrators using transistors and sweep circuits.

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

1. Design the power amplifiers
2. Design the tuned amplifiers and analyse its frequency response
3. Design Multivibrators and sweep circuits for various applications.
4. Utilize the concepts of synchronization, frequency division and sampling gates

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	-	3	2	-	-	-	-	1
CO2	3	3	3	1	-	2	2	-	-	-	-	1
CO3	3	3	3	1	-	2	2	-	-	-	-	1
CO4	3	3	3	1	-	3	2	-	-	-	-	1

UNIT - I

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 and D Amplifiers.

UNIT- II

Tuned Amplifiers: Introduction, single Tuned Amplifiers – Q-factor, frequency response, Double Tuned Amplifiers – Q-factor, frequency response, Concept of stagger tuning and synchronous tuning

UNIT - III

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

UNIT - IV

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.

UNIT - V

Synchronization and Frequency Division: Pulse Synchronization of Relaxation Devices, Frequency division in Sweep Circuits, 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.

Sampling Gates: Basic operating principles of Sampling Gates, Unidirectional and Bi-directional Sampling Gates, Four Diode Sampling Gate, Reduction of pedestal in Gate Circuits

TEXT BOOKS:

1. Jacob Millman, Christos C Halkias - Integrated Electronics, , McGraw Hill Education.
2. J. Millman, H. Taub and Mothiki S. PrakashRao - Pulse, Digital and Switching Waveforms – 2nd Ed., TMH, 2008,

REFERENCE BOOKS:

1. David A. Bell - Electronic Devices and Circuits, 5th Ed., Oxford.
2. Robert L. Boylestead, Louis Nashelsky - Electronic Devices and Circuits theory, 11th Ed., Pearson, 2009
3. Ronald J. Tocci - Fundamentals of Pulse and Digital Circuits, 3rd Ed., 2008.
4. David A. Bell - Pulse, Switching and Digital Circuits, 5th Ed., Oxford, 2015.

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

L	T	P	C
0	0	2	1

Note:

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

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

1. Design and implement various Analog modulation and demodulation Techniques and observe the time and frequency domain characteristics
2. Design and implement various Pulse modulation and demodulation Techniques and observe the time and frequency domain characteristics
3. Apply different types of Sampling with various Sampling rates and duty Cycles
4. Design and implement various Digital modulation and demodulation Techniques and observe the waveforms of these modulated Signals practically

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	3	1	2	2	-	2	3	2	-	1
CO2	1	-	3	1	2	2	-	2	3	2	-	1
CO3	1	-	3	1	2	2	-	2	3	2	-	1
CO4	1	-	3	1	2	2	-	2	3	2	-	1

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. DPCM Generation and Detection
12. Frequency Shift Keying: Generation and Detection
13. Binary Phase Shift Keying: Generation and Detection
14. Generation and Detection (i) DPSK (ii) QPSK
15. Generate FSK modulated signal using PLL

*Prove practically the Figure of Merit of DSB-SC is unity for single tone modulation

Major Equipment 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

EC407PC: LINEAR AND DIGITAL IC APPLICATIONS LABORATORY**B.Tech. II Year II Semester****L T P C**
0 0 2 1**Course Outcomes:** Upon completing this course, the student able to

1. Design and implementation of various analog circuits using 741 ICs.
2. Design and implementation of various Multivibrators using 555 timer.
3. Design and implement various circuits using digital ICs.
4. Design and implement ADC, DAC and voltage regulators.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	0	3	3	3	-	-	-	3	3	-	1
CO2	1	0	3	3	3	-	-	-	3	3	-	1
CO3	1	0	3	3	3	-	-	-	3	3	-	1
CO4	1	0	3	3	3	-	-	-	3	3	-	1

Note:

- Minimum 12 experiments should be conducted.
- Verify the functionality of the IC in the given application.

Design and Implementation of:

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op Amp and draw the comparison results of $A=B$, $A<B$, $A>B$.
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHZ and find the roll off of it.
6. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its dutycycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Frequency modulator and demodulator circuit and draw the respective waveforms.
11. Design Voltage Regulator using IC723, IC 7805/7809/7912 and find its load regulation factor.
12. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
13. Design Parallel comparator type/ counter type/ successive approximation ADC and find its efficiency.
14. Design a Gray code converter and verify its truth table.
15. Design an even priority encoder using IC 74xx and verify its truth table.
16. Design a 8x1 multiplexer using digital ICs.

17. Design a 4-bit Adder/Subtractor using digital ICs and Add/Sub the following bits. (i)1010 (ii)0101 (iii)1011
 0100 0010 1001.
18. Design a Decade counter and verify its truth table and draw respective waveforms.
19. Design a Up/down counter using IC74163 and draw read/write waveforms.
20. Design a Universal shift register using IC 74194/195 and verify its shifting operation.
21. Design a 16x4 RAM using 74189 and draw its read/write operation.
22. Design a 8x3 encoder/3x8 decoder and verify its truth table.

Major Equipment required for Laboratories:

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

EC408PC: ELECTRONIC CIRCUIT ANALYSIS LABORATORY**B.Tech. II Year II Sem.****L T P C**
0 0 2 1**Note:**

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

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

1. Design power amplifiers and find its efficiency
2. Design tuned amplifiers and find its Q-factor
3. Design various multivibrators and sweep circuits. Understand the necessity of linearity
4. Design sampling gates and understanding the concepts of frequency division

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	0	3	3	3	-	-	-	3	3	-	1
CO2	1	0	3	3	3	-	-	-	3	3	-	1
CO3	1	0	3	3	3	-	-	-	3	3	-	1
CO4	1	0	3	3	3	-	-	-	3	3	-	1

Hardware Testing in Laboratory:

1. Design transformer coupled class A power amplifier and draw the input and output waveforms find its efficiency
2. Design class B power amplifier and draw the input and output waveforms, find 2nd order and above harmonics.
3. Prove that the complementary symmetry pushpull amplifier eliminate cross over distortion.
4. Design class C power amplifier and draw the input and output waveforms
5. Design a single tuned amplifier and determine the Q of its tuned circuit practically.
6. Design a Bistable Multivibrator and analyze the effect of commutating capacitors and draw the wave forms at base and collector of transistors.
7. Design an Astable Multivibrator and draw the wave forms at base and collector of transistors.
8. Design a Monostable Multivibrator and draw the input and output waveforms
9. Draw the response of Schmitt trigger for gain of greater than and less than one.
10. Design a Bootstrap sweep circuit using BJT and draw its output time base waveform
11. Design a Miller sweep circuit using BJT and draw its output time base waveform.
12. Design a constant current sweep generator and draw input and output waveforms
13. Design unidirectional and bidirectional sampling gates
14. Prove practically Schmitt Trigger generates square wave
15. Frequency division with sweep circuit

Major Equipment 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

MC410: GENDER SENSITIZATION LAB*B.Tech. II Year II Sem.****L T P C**
0 0 2 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 labor 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 Is 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.

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

EC501PC: MICROCONTROLLERS

B.Tech. III Year I Semester

L T P C

3 1 0 4

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

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	2	1	-	-	-	1	1
CO2	3	3	3	2	2	2	1	-	-	-	1	1
CO3	3	3	3	2	2	2	1	-	-	-	1	1
CO4	3	3	3	2	2	2	1	-	-	-	2	2

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. A. K. Ray and K. M. Bhurchandani -Advanced Microprocessors and Peripherals, TMH, 2nd Edition 2006.
2. Andrew N SLOSS, Dominic SYMES, Chris WRIGHT -ARM System Developers guide, Elsevier,2012

REFERENCE BOOKS:

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

EC502PC: IOT ARCHITECTURES AND PROTOCOLS**B.Tech. III Year I Semester****L T P C**
3 0 0 3**Prerequisite:** Nil**Course Objectives:**

1. To provide the basic knowledge on IoT.
2. To explain the different components and Architectures from M2M to IoT.
3. To provide knowledge on different protocols of IoT.
4. To impart knowledge on implementations of different protocols of IoT.

Course Outcomes: After completion of this course the student will able to

1. Explore the Evolution of IoT, its Growth and Applications.
2. Know the components of IoT and Compare the various architectures of IoT.
3. Acquire the knowledge on data management of IoT.
4. Establish the knowledge on various IoT protocols like Data link, Network, Transport, Session, Service layers.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	2	2	2	1	-	-	-	1	1
CO2	3	1	3	2	2	2	1	-	-	-	1	1
CO3	3	1	3	2	2	2	1	-	-	-	1	1
CO4	3	1	3	2	2	2	1	-	-	-	2	2

UNIT- I**IOT introduction:**

Introduction and definition of IoT, Evolution of IoT, IoT growth, Application areas of IoT, Characteristics of IoT, IoT stack, Enabling technologies, IoT levels, IoT sensing and actuation, Sensing types, Actuator types.

UNIT - II**IOT and M2M:**

M2M to IoT — A Basic Perspective— Introduction, Differences and similarities between M2M and IoT, SDN and NFV for IoT, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, international driven global value chain and global information monopolies.

IOT Architecture:

IoT Architecture components, Comparing IoT Architectures, A simplified IoT Architecture, core IoT functional stack, IoT data management and compute stack

UNIT- III**IOT Data link layer and Network layer protocols:**

PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP

UNIT- IV

Transport and Session layer protocols:

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer HTTP, CoAP, XMPP, AMQP, MQTT

UNIT- V

Service layer protocols and Security:

Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 6LoWPAN, RPL, Application Layer.

TEXT BOOKS:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy -Introduction to IOT, Cambridge University Press.
2. David Hanes, Gonzalo salgueiro, Patrick Grossetete, Rob barton, Jerome henry- IoT Fundamentals Networking Technologies, Protocols and Usecases for IoT”, Cisco Press.

REFERENCE BOOKS:

1. Cunopfister-Getting started with the internet of things, O Reilly Media, 2011
2. Francis daCosta,-Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1 st Edition, Apress Publications.
3. Arshdeep Bahga, Vijay Madisetti -Internet of Things A Hands-on approach, Universities Press
4. Shriram K Vasudevan, RMD Sundaram, Abhishek S Nagarajan-Internet of things, John Wiley and Sons.
5. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers

EC503PC: CONTROL SYSTEMS**B.Tech. III Year I Semester****L T P C**
3 1 0 4

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

Course objectives:

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

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

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

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	2	1	-	-	-	-	1
CO2	3	2	3	2	-	2	1	-	-	-	-	1
CO3	3	3	3	2	-	2	1	-	-	-	-	1

UNIT - 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.

UNIT - 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.

UNIT - 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.

UNIT - 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.

UNIT - 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.
2. 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****L T P C****3 0 0 3****Course Objective:**

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

Course Outcome: The students will understand

1. The various Forms of Business and the impact of economic variables on the Business.
2. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.
3. The firm's financial position by analysing
4. The Financial Statements of a Company.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	1	1	3	2	3	1
CO2	-	-	-	-	-	2	1	1	3	2	3	1
CO3	-	-	-	-	-	2	1	1	3	2	3	1
CO4	-	-	-	-	-	2	1	1	3	2	3	1

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, 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, 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.

REFERENCE BOOKS:

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.

EC511PE: COMPUTER ORGANIZATION & OPERATING SYSTEMS (PE-I)**B.Tech. III Year I Semester****L T P C****3 0 0 3****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: After completion of this course the student will able to

1. Visualize the organization of different blocks in a computer.
2. Utilize the micro-level operations to control different units in a computer.
3. Implement Operating systems in a computer.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	2	1	1	1	-	1	-	1
CO2	3	2	1	1	2	1	1	1	-	1	-	1
CO3	3	2	1	1	2	1	1	1	-	1	-	1

UNIT - I

Basic Structure of Computers: Computer Types, Functional Unit, Basic operational Concepts Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, FixedPoint Representation, Floating – Point Representation.

Register Transfer Language and Micro Operations: Register Transfer Language, Register TransferBus 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 TransferModes, 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. Carl Hamacher, Zvonks Vranesic, Safea Zaky - Computer Organization, 5th Edition, McGrawHill.
2. M. Moris Mano -Computer Systems Architecture, 3rd Edition, Pearson
3. Abraham Silberchatz, Peter B. Galvin, Greg Gagne -Operating System Concepts, 8th Edition,John Wiley.

REFERENCE BOOKS:

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

EC512PE: DATA COMMUNICATIONS AND COMPUTER NETWORKS (PE-I)**B.Tech. III Year I Semester****L T P C**
3 0 0 3**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.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	1	1	1	-	-	-	1
CO2	3	2	2	1	2	1	1	1	-	-	-	1
CO3	3	2	2	1	2	1	1	1	-	-	-	1
CO4	3	2	2	1	1	1	1	1	-	-	-	1
CO5	3	2	2	1	1	1	1	1	-	-	-	1

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 DataTransfer-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 ofCongestion, 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.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

EC513PE: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE-I)**B.Tech. III Year I Semester****L T P C****3 0 0 3****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.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	-	-	-	-	-	1
CO2	3	2	3	2	-	-	-	-	-	-	-	1
CO3	3	2	3	2	-	-	-	-	-	-	-	1
CO4	3	2	3	2	-	-	-	-	-	-	-	1

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 5th Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

REFERENCE BOOKS:

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: MICROCONTROLLERS LABORATORY**B.Tech. III Year I Semester**

L	T	P	C
0	0	2	1

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

1. Write assembly language programs and implement on 8086.
2. Write assembly language programs and implement on 8051
3. Interface the I/O devices with 8051 micro controllers
4. Perform experiments on Cortex-M3 development boards using GNU tool-chain

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	-	-	-	1
CO2	3	3	3	3	3	-	-	-	-	-	-	1
CO3	3	3	3	3	3	-	-	-	-	-	-	1
CO4	3	3	3	3	3	-	-	-	-	-	-	1

Cycle 1: Using 8086 Processor Kits and/or Assembler

- 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

- 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

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.

Cycle 4: Experiments to be carried out on Cortex-M3 development boards and using GNU tool-chain

1. Blink an LED with software delay, delay generated using the SysTick timer.
2. System clock real time alteration using the PLL modules.
3. Control intensity of an LED using PWM implemented in software and hardware.
4. Control an LED using switch by polling method, by interrupt method and flash the LED once every five switch presses.

EC506PC: IOT ARCHITECTURE AND PROTOCOLS LABORATORY**B.Tech. III Year I Semester****L T P C****0 0 2 1****Course Outcomes:** Upon completing this course the students will be able to:

1. Utilize the different sensors like room temperature, DHT, Humidity etc.,
2. Interface the sensors and processor for transmission of data.
3. Capture the images and process it on Arduino/NodeMCU/Raspberry Pi.
4. know the utilization of various protocols like I2c, UART communication etc.,

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	1	1	-	-	-	-	1
CO2	3	2	3	3	3	1	1	-	-	-	-	1
CO3	3	2	3	3	3	1	1	-	-	-	-	1
CO4	3	2	3	3	3	1	1	-	-	-	-	1

List of Experiments:

1. Demonstrate blinking of an LED at every 5 seconds and to control the brightness of an LED.
2. Read Humidity and Room Temperature using DHT sensor and display the readings.
3. Send the recorded values of Temperature/Humidity to the Internet via GSM module using Arduino/NodeMCU/Raspberry Pi.
4. Demonstrate Interfacing NodeMCU/Raspberry Pi with the Cloud using REST API and MQTT protocol.
5. Demonstrate Switching lights on /off remotely using Arduino/NodeMCU/Raspberry Pi.
6. Voice-based Home Automation for switching lights on/off using Google Assistant, IFTTT and MQTT.
7. Interfacing DHT11 sensor with Raspberry pi/equivalent and upload temperature and humidity values to the cloud.
8. Design an obstacle detection unit using ultrasonic sensor.
9. Capture images from web camera using Raspberry Pi/equivalent and apply filters in increase image quality.
10. Access a remote computer from Raspberry Pi and display the remote screen.
11. Design an automatic water sprinkler based on soil moisture using Arduino/NodeMCU/Raspberry Pi.
12. Design an RFID based attendance system using Arduino/NodeMCU/Raspberry Pi.
13. Write an arduino program to demonstrate interrupts
14. Write an arduino program to demonstrate UART communication protocol
15. Write an arduino program to demonstrate I2C communication protocol
16. Write an arduino program to demonstrate SPI communication protocol

EN508HS: ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY**B.Tech. III Year I Semester****L T P C**
0 0 2 1**1. Introduction**

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career 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 appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. 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, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

3. Syllabus:

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

- **Activities on Listening and Reading Comprehension:** Active Listening — Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading- Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub-skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.

2. **Activities on Writing Skills:** Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing – Writing a Letter of Application – Resume vs. Curriculum Vitae
 – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette
 – Report Writing – Importance of Reports – Types and Formats of Reports – Technical Report Writing – Exercises for Practice.
3. **Activities on Presentation Skills** - Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation
4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies
 – Exercises for Practice.
5. **Interview Skills:** Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - 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
- One PC with latest configuration for the teacher
- 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.

- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner's Dictionary**, 10th Edition

- **Cambridge Advanced Learner's Dictionary**
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech

6. Books Recommended:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed.). McGraw Hill Education(India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English*. Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). *Academic Writing: A Handbook for International Students*. (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). *Technical Communication, Principles and Practice*. (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication*. Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use* Series. Cambridge University Press
8. Sen, Leela. (2009). *Communication Skills*. PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). *Writing with Power*. Oxford University Press.
10. Goleman, Daniel. (2013). *Emotional Intelligence: Why it can matter more than IQ*. Bloomsbury Publishing.

***MC510: INTELLECTUAL PROPERTY RIGHTS**

B.Tech. III Year I Semester

L T P C

3 0 0 0

Course Objectives:

- Significance of intellectual property and its protection
- Introduce various forms of intellectual property

Course Outcomes:

- Distinguish and Explain various forms of IPRs.
- Identify criteria to fit one's own intellectual work in particular form of IPRs.
- Apply statutory provisions to protect particular form of IPRs.
- Appraise new developments in IPR laws at national and international level

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 copyrights: Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

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

UNIT – IV

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

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

International overview on intellectual property, international — trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOK:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOK:

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

EC601PC: ANTENNAS AND WAVE PROPAGATION**B.Tech. III Year II Semester****L T P C****3 0 0 3****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

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

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	-	1	1	-	-	-	-	1
CO2	3	2	2	3	1	1	1	-	-	-	-	1
CO3	3	2	2	3	1	1	1	-	-	-	-	1
CO4	3	2	2	3	1	1	1	-	-	-	-	1

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

REFERENCE BOOKS:

1. C.A. Balanis - Antenna Theory, 3rd Edition. John Wiley & Sons, 2005.
2. K.D. Prasad, Satya Prakashan - Antennas and Wave Propagation, Tech India Publications, New Delhi, 2001.
3. Keith henney - Radio Engineering Handbook, 3rd edition TMH.
4. John Leonidas Volakis -Antenna Engineering Handbook, 3rd edition, 2007

EC602PC: DIGITAL SIGNAL PROCESSING**B.Tech. III Year II Semester****L T P C****3 0 0 3****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. Explore the LTI system characteristics and Multirate signal processing.
2. Establish the inter-relationship between DFT and various transforms.
3. Design a digital filter for a given specification.
4. Demonstrate the various filter structures and effects of round off errors.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	-	1	1	-	-	-	1	1
CO2	3	3	2	3	-	1	1	-	-	-	1	1
CO3	3	3	2	3	3	1	1	-	-	-	1	1
CO4	3	3	2	3	3	1	1	-	-	-	1	1

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

REFERENCE BOOKS:

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

EC603PC: CMOS VLSI DESIGN**B.Tech. III Year II Semester****L T P C****3 0 0 3****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. Explore 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.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	-	-	-	1	1
CO2	3	3	2	2	1	1	1	-	-	-	1	1
CO3	3	3	2	2	3	1	1	-	-	-	1	1
CO4	3	3	2	2	3	1	1	-	-	-	1	1

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. Kamran Eshraghian, Eshraghian Douglas and A. Pucknell - Essentials of VLSI circuits and systems, PHI, 2005
2. Neil H. E Weste, David Harris, Ayan Banerjee - CMOS VLSI Design – A Circuits and Systems Perspective, 3rd Edition, Pearson, 2009.

REFERENCE BOOKS:

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

EC621PE: DIGITAL IMAGE PROCESSING (PE – II)**B.Tech. III Year II Semester****L T P C****3 0 0 3****Prerequisite:** Digital Signal Processing**Course Objectives:**

1. To provide a approach towards image processing and introduction about 2D transforms
2. To expertise about enhancement methods in time and frequency domain
3. To expertise about segmentation and compression techniques
4. To understand the Morphological operations on an image

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

1. Explore the fundamental relations between pixels and utility of 2-D transforms in image processor.
2. Articulate the enhancement, segmentation and restoration processes on an image.
3. Implement the various Morphological operations on an image
4. Utilize basic compression algorithms.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	-	1	1	-	-	-	-	1
CO2	3	3	2	2	3	1	1	-	-	-	-	1
CO3	3	3	2	2	3	1	1	-	-	-	-	1
CO4	3	3	2	2	3	1	1	-	-	-	-	1

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. Rafael C. Gonzalez, Richard E. Woods -Digital Image Processing, 3rd Edition, Pearson, 2008
2. S Jayaraman, S Esakkirajan, T Veerakumar - Digital Image Processing- - TMH, 2010.

REFERENCE BOOKS:

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

EC622PE: MOBILE COMMUNICATIONS AND NETWORKS (PE-II)**B.Tech. III Year II Semester****L T P C****3 0 0 3****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. Explore the Co-Channel and Non-Co-Channel interferences.
3. Known 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. Demonstrate the difference between cellular and Adhoc Networks and design goals of MAC Layer protocol.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	-	-	-	-	1
CO2	3	3	2	2	1	1	1	-	-	-	-	1
CO3	3	3	2	2	1	1	1	-	-	-	-	1
CO4	3	3	2	2	1	1	1	-	-	-	-	1
CO5	3	3	2	2	1	1	1	-	-	-	-	1

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. W.C.Y. Lee - Mobile Cellular Telecommunications, 2nd edition, Mc Graw Hill, 1989.
2. Theodore. S. Rapport - Wireless Communications, 2nd edition, Pearson Education, 2002.

REFERENCE BOOKS:

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

EC623PE: EMBEDDED SYSTEM DESIGN (PE-II)**B.Tech. III Year II Semester****L T P C****3 0 0 3****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. Familiarize the selection procedure of Processors in the embedded domain.
2. Design Procedure for Embedded Firmware.
3. Visualize the role of Real time Operating Systems in Embedded Systems.
4. Evaluate the Correlation between task synchronization and latency issues

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	1	1	-	-	-	-	1
CO2	3	3	2	2	3	1	1	-	-	-	-	1
CO3	3	3	2	2	3	1	1	-	-	-	-	1
CO4	3	3	2	2	3	1	1	-	-	-	-	1

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 BOOK

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

REFERENCE BOOKS:

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

EC604PC: DIGITAL SIGNAL PROCESSING LABORATORY**B.Tech. III Year II Semester****L T P C**
0 0 2 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).

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: CMOS VLSI DESIGN LABORATORY**B.Tech. III Year II Semester****L T P C**
0 0 2 1

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, IRdrop 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: ADVANCED COMMUNICATIONS LABORATORY**B.Tech. III Year II Semester****L T P C**
0 0 2 1**Note: Minimum Eight experiments should be conducted:**

1. Study the features of Network and spectrum analyzer
2. Simulate the Radiation pattern for different antennas using HFSS/ ADS/Matlab and compare the measurement using Network analyzer.
 - i. Dipole Antenna
 - ii. Horn antenna
 - iii. Microstrip Antenna etc.
3. Simulate the Radiation resistance for different antennas using HFSS/ ADS/ MATLAB and compare the measurement using Network analyzer.
 - i. Dipole Antenna
 - ii. Horn antenna
 - iii. Microstrip Antenna etc.
4. Plotting eye diagram for baseband signal using MATLAB and verifying using Network analyzer.
5. Plotting Constellation Diagram of QAM using MATLAB and verify using kit.
6. OFDM generation and detection using Simulink and verify using kit.
7. Generation of different types of signals using Vector Signal Generator
8. Modulation analysis on digital modulated single carrier signals using MATLAB.
9. Reading analog and digital sensors data using UART Using ICONT setup.
10. Collecting sensor values of remote nodes using RIME broadcasting Using ICONT setup.

EC611OE: FUNDAMENTALS OF INTERNET OF THINGS (OE – I)**B.Tech. III Year II Semester****L T P C**
3 0 0 3**Course Objectives:** The objectives of the course are to:

- Make concepts of Internet of Things understandable to build IoT applications.
- Teach the programming and use of Arduino and Raspberry Pi boards.
- Provide Knowledge about data handling and analytics in SDN.

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

- Know basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Design IoT applications in different domains.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	-	-	-	-	2	1	1
CO2	1	1	1	-	3	-	-	-	-	1	1	2
CO3	1	1	1	-	3	-	-	-	-	1	1	2
CO4	1	1	3	-	3	-	-	-	-	1	1	2

UNIT – I Introduction to Internet of Things: Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II Machine-to-Machine Communications: Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT – III Introduction to Python programming: Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi.

UNIT - IV Implementation of IoT with Raspberry Pi: Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V Cloud Computing: Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.

Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Make sensors": Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media, 2014.
3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

REFERENCE BOOKS:

1. Vijay Madiseti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenequs Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

EC612OE: PRINCIPLES OF SIGNAL PROCESSING (OE- I)**B.Tech. III Year II Semester****L T P C****3 0 0 3****Course Objectives:**

1. To give the basics of Signals and Systems required for all Engineering related courses.
2. To provide the basic characteristics of LTI systems.
3. To provide knowledge on signal transmission requirements.
4. To give basic understanding of signal statistical properties and noise source concepts.

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

1. Differentiate various signal functions.
2. Understand the characteristics of linear time invariant systems.
3. Understand the concepts of sampling theorem and signal to noise ratios.
4. Determine the Spectral and temporal characteristics of Signals.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	1	-	1	-	-	-	1	1	1
CO2	3	1	-	2	-	1	-	-	-	1	1	1
CO3	2	2	-	3	-	1	-	-	-	1	1	1
CO4	3	1	-	2	-	1	-	-	-	1	1	1

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: 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, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT III: 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.

UNIT IV: Temporal characteristics of signals: Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Time Averages and Ergodicity, Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Cross-Correlation Function and Its Properties, Power Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function.

UNIT V: Noise sources: 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.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2013.
2. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4 th Ed., 2001.

REFERENCE BOOKS:

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.
2. Fundamentals of Signals and Systems - Michel J. Robert, MGH, 2008.
3. Random Processes for Engineers-Bruce Hajck, Cambridge unipress, 2015
4. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

EC613OE: DIGITAL ELECTRONICS FOR ENGINEERING (OE-I)**B.Tech. III Year II Semester****L T P C****3 0 0 3****Course Objectives:**

1. To provide basic understanding of properties and theorems of Boolean Algebra.
2. To provide knowledge on logic gates and universal gates.
3. To teach techniques to reduce the Boolean expressions using K map.
4. To give introduction to Logic families and different types Integrated circuits.

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

1. Get basic knowledge on logic gates, Universal gates and their switching logics.
2. Realize Boolean expressions using NAND/NOR gates and reduce them using K map.
3. Know all types of combinational and sequential circuits.
4. Acquire knowledge on realization of logic families using diodes and transistor, and also on different types of integrated circuits.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	-	-	-	-	-	1	-	-	1
CO2	2	2	3	2	-	-	-	-	1	-	-	1
CO3	1	1	2	1	-	-	-	-	1	-	-	1
CO4	1	1	1	-	-	-	-	-	1	-	-	1

UNIT - I: Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties. 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 four 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, Fundamentals of shift registers, ripple and decade counters.

UNIT - IV: 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, standard TTL NAND Gate Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate,

UNIT - V 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 opamp and its features, modes of operation-inverting, non-inverting, differential.

TEXT BOOKS:

1. Switching and Finite Automata Theory - ZviKohavi& Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- Tata McGraw-Hill
3. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p) Ltd.
4. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

REFERENCE BOOKS:

1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI
3. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.

B.Tech. III Year II Semester

L T P C

0 0 2 1

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: Based on this course, the Engineering graduate will

1. 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, 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, 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 PHI 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.