GURU NANAK INSTITUTIONS TECHNICAL CAMPUS

(An UGC Autonomous Institution - Affiliated to JNTUH)
Ibrahimpatnam, Ranga Reddy (District), Hyderabad - 501 506.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Regulation – R 22

COURSE STRUCTURE

(Applicable for the batch admitted from 2022-23)

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	22BS0MA06	Numerical Methods and Complex Variables	3	1	0	4
2	22PC0EC03	Analog Circuits	3	0	0	3
3	22PC0EE05	Network analysis and Synthesis	3	0	0	3
4	22PC0EC04	Digital Logic Design	3	0	0	3
5	22PC0EC05	Signals and Systems	3	1	0	4
6	22PC0EC06	Analog Circuits Laboratory	0	0	2	1
7	22PC0EC07	Digital logic Design Laboratory	0	0	2	1
8	22PC0EC08	Basic Simulation Laboratory	0	0	2	1
9	22MC0MB01	Constitution of India	3	0	0	0
		Total Credits	**18**	**2**	**6**	**20**

Dr.S.Maheswara Reddy
HOD& BOS Chairman

Dr. P. Chandrasekhar Reddy
JNTUH Nominee

Dr. Manjunath Chari
GITAM University

Mr. T. S. Rama Krishna
DDG(E), Doordarshan, Hyd

Dr. Ibrahim Patel
Academic Council
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COURSE STRUCTURE

(Applicable for the batch admitted from 2022-23)

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	22PC0EC09	Probability Theory and Stochastic Processes	3	0	0	3
2	22PC0EC10	Electromagnetic Fields and Transmission Lines	3	0	0	3
3	22PC0EC11	Analog and Digital Communications	3	0	0	3
4	22PC0EC12	Linear and Digital IC Applications	3	0	0	3
5	22PC0EC13	Electronic Circuit Analysis	3	0	0	3
6	22PC0EC14	Analog and Digital Communications Laboratory	0	0	2	1
7	22PC0EC15	Linear and Digital IC Applications Laboratory	0	0	2	1
8	22PC0EC16	Electronic Circuit Analysis Laboratory	0	0	2	1
9	22PR0EC01	Real Time Project/ Field Based Project	0	0	4	2
10	22MC0EN04	Gender Sensitization Lab	0	0	2	0
		Total Credits	**15**	**0**	**12**	**20**

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Regulation – R 22

COURSE STRUCTURE FOR SERVICE DEPARTMENTS

(Applicable from the batch admitted during 2022-23 onwards)

II Year Semester 1

(For branches CSE,CSC,CSD & EEE)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22ES0EC02	Digital Electronics	3	0	0	3

(For branches IT,AIDS,CSO)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22ES0EC02	Digital Electronics	3	0	0	3
2	22ES0EC03	Digital Electronics Laboratory	0	0	2	1

(For branch EEE)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22PC0EC17	Analog Electronic Circuits	3	0	0	3
2	22PC0EC18	Analog Electronic Circuits Laboratory	0	0	2	1

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Regulation – R 22

COURSE STRUCTURE

(Applicable for the batch admitted from 2022-23)

II Year Semester II

(For branch EEE)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22ES0EC02	Digital Electronics	3	0	0	3
2	22ES0EC03	Digital Electronics Laboratory	0	0	2	1

(For branch CSO)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22PC0EC19	Sensors and Devices	3	0	0	3
2	22PC0EC20	Sensors and Devices Laboratory	0	0	2	1

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Regulation – R 22

COURSE STRUCTURE

(Applicable for the batch admitted from 2022-23)

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	22BS0MA06	Numerical Methods and Complex Variables	3	1	0	4
2	22PC0EC03	Analog Circuits	3	0	0	3
3	22PC0EE05	Network analysis and Synthesis	3	0	0	3
4	22PC0EC04	Digital Logic Design	3	0	0	3
5	22PC0EC05	Signals and Systems	3	1	0	4
6	22PC0EC06	Analog Circuits Laboratory	0	0	2	1
7	22PC0EC07	Digital logic Design Laboratory	0	0	2	1
8	22PC0EC08	Basic Simulation Laboratory	0	0	2	1
9	22MC0MB01	Constitution of India	3	0	0	0
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L	T	P	C
3	1	0	4

B. Tech, II Year I-Semester
Numerical Methods and Complex Variables (Theory)

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.

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'sintegral and residue theorems.

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Academic Council Nominee

5). Dr. V. Shyam Prasad
GNITC, Member

6). Dr. G. Mahender Reddy
GNITC, Member

7). Ms. T. Vijaya Lakshmi
GNITC, Member

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

Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms:Fourier Sine andcosine transforms - Inverse 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. Jacobi and Gauss-Seidal iteration methods for solving linear systems of equations.

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 $1/3^{rd}$ and $3/8^{th}$ 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, elementary analytic functions(exponential, trigonometric, logarithm) and their properties. (All theoremswithout Proofs), Conformal mappings, Mobius transformations.

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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:

B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

REFERENCE BOOKS:

M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.

Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

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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, Source follower, Common Gate Stage.

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 -πmodel 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.

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Department of Electrical & Electronics Engineering

Regulation - R22

NETWORK ANALYSIS AND SYNTHESIS

B.Tech. ECE II Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

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

Course Outcomes:

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

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

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. 2^{nd} 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, □, 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, 2019.
2. JD Ryder - Networks, Lines and Fields, 2nd Ed., PHI, 2015.

REFERENCE BOOKS:

1. J. Edminister and M. Nahvi - Electric Circuits, Schaum's Outlines, Mc Graw Hills Education, 2018.
2. A. Sudhakar and Shyammohan S Palli - Networks & Circuits, 4th Ed., Tata McGraw- Hill Publications, 2017.
3. William Hayt and Jack E. Kimmerley - Engineering Circuit Analysis, 6th Ed., McGraw Hill Company, 2020.

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Mr. S. V. Raman
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Dr.K.S.Chandragupta Mauryan
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(Member)

Mr. G.Ranga Purushotham
(Member)

Mr. L. Sumanth Kumar
(Alumni)

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.

UNIT – V

Sequential Machines: Finite State Machines, capabilities and limitations, Mealy and Moore models, State equivalence, transition table and state diagram.

Finite state machine:

Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters, simplification of incompletely specified machines, Merger graphs.

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.

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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.

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Dr. Ibrahim Patel Academic Council Nominee, BVRIT	Dr. Vikas Maheswari Prof & HOD,Member	Dr. B. Anitha BOS Coordinator	Dr. Sandeep Patil Alumni Member

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.
3. Obtain the I/O Characteristics of CE, CB, CC amplifiers. Calculate h-parameters from the Characteristics.
4. Obtain the Drain and Transfer characteristics of CD, CS amplifiers of JFET. Calculate gm, rd from the Characteristics.
5. By experiment prove that the voltage gain of Emitter Follower Circuit is one.
6. Design a Common Emitter Amplifier with a gain of 30db and Bandwidth of 10KHZ and plot the frequency response practically.
7. Design a two stage RC Coupled amplifier and prove that gain is increased and analyze the effects of coupling capacitance.
8. Practically prove that the Darlington pair has high input impedance.
9. Draw the high frequency response of common emitter transistor amplifier and calculate $f\alpha$, $f\beta$ and gain bandwidth product.
10. Design a cascode amplifier for a given specifications
11. Design four topologies of feedback amplifiers and draw the frequency response of them with and without feedback.
12. Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
13. 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

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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 1's and 2's Compliment using Logic Gates.
2. Realization of given Boolean function using universal gates and minimizing the same. Compare thegate 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. Design a Synchronous binary counter using D-flipflop/given flipflop.
12. Design a asynchronous counter for the given sequence using given flipflops.
13. Designing of MOD 8 Counter using JK flipflops.
14. Realize all logic gates with TTL logic.
15. Realize all logic gates with DTL logic.

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.

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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 andFrequency domain
2. Analyze and Characterize Continuous and Discrete Time Systems both in Time andFrequency 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 andon 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 UnitImpulse, 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/DiscreteSystem.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system andverifying its physical realiazability and stability properties.
9. Gibbs Phenomenon Simulation.

10. Finding the Fourier Transform of a given signal and plotting its magnitude and phasespectrum.
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 thegiven transfer function.
13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value andits 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

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CONSTITUTION OF INDIA (22MC0MB01)

B.Tech. II Year I Sem. (ECE, CIVIL, MECH, IOT, AIML, AIDS)
B.Tech II Year II Sem (EEE, IT, CS

L	T	P	C
3	0	0	0

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 ZilaPanchayat: 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.

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	Dr.Ravi Sanker Kummeta Member - BOS	Mr.C.Prakash Reddy Member - BOS	Mr.K.Sandeep Reddy Member - BOS	Ms.B.Soujanya Member - BOS

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Regulation – R 22

COURSE STRUCTURE FOR SERVICE DEPARTMENTS

(Applicable from the batch admitted during 2022-23 onwards)

II Year Semester 1

(For branches CSE,CSC,CSD & EEE)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22ES0EC02	Digital Electronics	3	0	0	3

(For branches IT,AIDS,CSO)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22ES0EC02	Digital Electronics	3	0	0	3
2	22ES0EC03	Digital Electronics Laboratory	0	0	2	1

(For branch EEE)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22PC0EC17	Analog Electronic Circuits	3	0	0	3
2	22PC0EC18	Analog Electronic Circuits Laboratory	0	0	2	1

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R22 B. Tech

DIGITAL ELECTRONICS

B.Tech. II Year I Sem. L T P C

3 0 0 3

Course Objectives: This course aims at a thorough understanding of the binary number system, logic gates, combination logic and synchronous and asynchronous logic.

UNIT - I:

BOOLEAN ALGEBRA AND LOGIC GATES: Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers Number base conversions, signed binary numbers, complements, One's and Two's complement arithmetic, Binary codes (BCD, Gray, Xcess-3)

Boolean Algebra: Basic theorems and properties, canonical and standard forms, Digital logic gates, and Examples of IC gates

UNIT - II:

GATE–LEVEL MINIMIZATION: Standard representation of a logic function, The K-map method, Don't-care conditions, Three-variable, Four-variable K-maps, Q-M method of function realization, SOP & POS simplifications, implementation of a Boolean function using Universal gates.

Exclusive – OR function.

UNIT - III:

COMBINATIONAL LOGIC: Combinational Circuits, Binary Adder-Subtractor, 2-bit Binary multiplier,2-bit magnitude comparator, Decoders, Encoders, Multiplexer,

Demultiplexer, Code Converters (Binary to Gray, Gray to Binary, Xcess-3 to BCD, BCD to Xcess-3)

UNIT - IV:

SEQUENTIAL LOGIC CIRCUITS: Sequential circuits, latches, introduction Flip-Flops, SR, JK, D & T flipflops, state Reduction and Assignment, Registers, shift Registers, Synchronous and Asynchronous Counters, Ring Counter, Johnson Counter.

UNIT – V:

SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read-only memory (ROM), ROM types, Read and write memory (RAM) types, Programmable logic array, Programmable array logic, Sequential Programmable Devices.

TEXTBOOKS:

1. Digital Design – Third Edition, M. Morris Mano, Pearson Education/PHI.

2. Digital Principles and Applications Albert Paul Malvino Donald P. Leach TATA McGraw Hill

Edition.

3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson.

4. R. P Jain, Modern Digital Electronics, McGraw Hill Education

REFERENCE BOOKS:

1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.

2. Switching and Logic Design, C.V.S. Rao, Pearson Education

3. Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition.

4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiquzzaman John Wiley

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DIGITAL ELECTRONICS LAB

B.Tech. II Year I Sem

L T P C

0 0 2 1

Prerequisites: Analog Electronics & Digital Electronics

Course Objectives:

- To learn basic techniques for the design of digital circuits and number conversion systems.
- To implement simple logical operations using combinational logic circuits.
- To design combinational logic circuits, sequential logic circuits.

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

- Understand the working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Analyze different types of semiconductor memories.

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND/NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4-bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
8. Design and realization Asynchronous and Synchronous counters using flip-flops
9. Design and realization 8x1 using 2x1 Mux
10. Design and realization 2-bit comparator
11. Verification of truth tables and excitation tables
12. Realization of logic gates using DTL, TTL, ECL, etc.,

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ANALOG ELECTRONIC CIRCUITS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
- Learn the concepts of high frequency analysis of transistors.
- To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
- To introduce the basic building blocks of linear integrated circuits.
- To introduce the concepts of waveform generation and introduce some special function ICs.

Course Outcomes: At the end of this course, students will be able to

- Know the characteristics, utilization of various components.
- Understand the biasing techniques
- Design and analyze various rectifiers, small signal amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Designs OP-AMP based circuits with linear integratedcircuits.

UNIT-I:

Diode and Bipolar Transistor Circuits: P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, clamping and clipping circuits. Input output characteristics of BJT in CB, CE, CC configurations, biasing circuits, Load line analysis, common-emitter, common-base and common collector amplifiers;Small signal equivalent circuits,

UNIT-II:

FET Circuits: FET Structure and VI Characteristics, MOSFET structure and I-V characteristics. MOSFET as a switch. small signal equivalent circuits - gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance.

UNIT-III:

Multi-Stage and Power Amplifiers: Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers, Power amplifiers - Class A, Class B, Class C

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.

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.

UNIT-V:

Operational Amplifiers: Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave andtriangular- wave generators.

TEXT BOOKS:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2nd edition 2010
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.

REFERENCE BOOKS:

1. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, pearson.
2. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog IntegratedCircuits", John Wiley & Sons, 2001.

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ANALOG ELECTRONIC CIRCUITS LABORATORY

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites: Analog Electronic Circuits

Course Objectives:

- To introduce components such as diodes, BJTs and FETs their switching characteristics,applications
- Learn the concepts of high frequency analysis of transistors.
- To give understanding of various types of basic and feedback amplifier circuits such assmallsignal, cascaded, large signal and tuned amplifiers.
- To introduce the basic building blocks of linear integrated circuits.
- To introduce the concepts of waveform generation and introduce some special function ICs.

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

- Know the characteristics, utilization of various components.
- Understand the biasing techniques
- Design and analyze various rectifiers, small signal amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Design OP-AMP based circuits with linearintegrated circuits.

List of Experiments:

1. Draw the VI Characteristics of given PN Junction diode. Determine the Static and Dynamicresistance of the Diode.
2. Determine the Ripple factor, %Regulation PIV and TUF of the given Rectifier with & withoutfilter.
3. Obtain the I/O Characteristics of CE configurations of BJT. Calculate h-parameters from theCharacteristics.
4. Obtain the I/O Characteristics of CB configurations of BJT. Calculate h-parameters from theCharacteristics.
5. Obtain the I/O Characteristics of CC configurations of BJT. Calculate h-parameters from theCharacteristics.
6. Obtain the Drain and Transfer characteristics of CD,CS configuration of JFET. Calculategm, rd from the Characteristics

7. Adder and Subtractor using Op Amp.
8. Inverting and Non-inverting Amplifiers using Op Amps
9. Adder and Subtractor using Op Amp
10. Integrator Circuit using IC 741.
11. Differentiator circuit using Op Amp.
12. Current Shunt Feedback amplifier
13. Design an RC phase shift oscillator circuit and derive the gain condition for oscillationspractically for given frequency.
14. Design a Colpitts oscillator circuit for the given frequency and draw the output waveform.
15. Design transformer coupled class A power amplifier and draw the input and outputwaveforms, find its efficiency

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Regulation – R 22

COURSE STRUCTURE

(Applicable for the batch admitted from 2022-23)

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	22PC0EC09	Probability Theory and Stochastic Processes	3	0	0	3
2	22PC0EC10	Electromagnetic Fields and Transmission Lines	3	0	0	3
3	22PC0EC11	Analog and Digital Communications	3	0	0	3
4	22PC0EC12	Linear and Digital IC Applications	3	0	0	3
5	22PC0EC13	Electronic Circuit Analysis	3	0	0	3
6	22PC0EC14	Analog and Digital Communications Laboratory	0	0	2	1
7	22PC0EC15	Linear and Digital IC Applications Laboratory	0	0	2	1
8	22PC0EC16	Electronic Circuit Analysis Laboratory	0	0	2	1
9	22PR0EC01	Real Time Project/ Field Based Project	0	0	4	2
10	22MC0EN04	Gender Sensitization Lab	0	0	2	0
		Total Credits	**15**	**0**	**12**	**20**

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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 known 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, Baye's Theorem, Independent Events

Random Variable-Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable

UNIT - II

Distribution and Density functions: Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

Operations on Single Random Variables

Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Moment Generating Function, Characteristic Function, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations.

UNIT - III

Multiple Random Variables

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.

Operations on Single Random Variables

Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Moment Generating Function, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT - IV

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

Noise Sources & Information Theory: Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off betweenbandwidth 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 Hajck - 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

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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 inbounded and unbounded media.

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

1. Acquire the knowledge of Basic Laws, Concept sand 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 (Line and surface) 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, 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 ofAmpere'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 Distortion less 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., OxfordUniversity Press, Aisan Edition, 2015.

REFERENCE BOOKS:

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

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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 in various applications
4. Analyze and design the base band Transmission

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	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, SSB modulation - time and frequency domain description, Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT - II

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

UNIT - III

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, 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, Differential PSK and QAM.

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

TEXT BOOKS

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

REFERENCE BOOKS

1. Herbert Taub, Donald L Schilling, Goutam Saha, -Principles of Communication Systems, 3rd Ed., 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

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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 1^{st} 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: Code Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Parity 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. Floydand Jain- Digital Fundamentals, 8th Ed., PearsonEducation,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, 3rdEd., Pearson, ,2009.
3. Salivahana -Linear Integrated Circuits and Applications, TMH, 2008.
4. William D.Stanley- Operational Amplifiers with Linear Integrated Circuits, 4thEd., Pearson Education India, 2009.

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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 twill 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 is 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: Frequency division in Sweep Circuits, Stability of Relaxation Devices, Synchronization of a Sweep Circuit with Symmetrical Signals, Sine wave frequency division with a Sweep Circuit.

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.

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ANALOG AND DIGITAL COMMUNICATIONS LABARATORY

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 other simulation 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. Frequency modulation and demodulation
3. DSB-SC Modulator & Detector
4. SSB-SC Modulator & Detector (Phase Shift Method)
5. Pulse Amplitude Modulation & Demodulation
6. Pulse Width Modulation & Demodulation
7. Pulse Position Modulation & Demodulation
8. PCM Generation and Detection
9. Delta Modulation
10. DPCM Generation and Detection
11. Frequency Shift Keying: Generation and Detection
12. Generation and Detection of DPSK

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

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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 Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
4. Design a Active LPF, HPF cutoff frequency of 2 KHZ and find the roll off of it.
5. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ and draw the output waveform.
6. Construct Mono-stableMultivibratorusingIC555 and draw its output waveform.
7. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its duty cycle.
8. Design a Schmitt Trigger Circuit and find its LTP and UTP.
9. Design Frequency modulator and demodulator circuit and draw the respective waveforms.
10. Design VoltageRegulatorusingIC723, IC 7805/7809/7912 and find its load regulation factor.
11. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
12. Design Parallel comparator type/ counter type/ successive approximation ADC and find its efficiency.
13. Design a Gray code converter and verify its truth table.
14. Design an priority encoder using IC 74xx and verify its truth table.
15. Design a 8x1 multiplexer using digital ICs.

16. Design a 4-bit Adder/Subtractor using digital ICs and Add/Sub the following bits.
    (i)1010 (ii)0101 (iii)1011
    0100 0010 1001.
17. Design a Decade counter and verify its truth table and draw respective waveforms.
18. Design a Up/down counter usingIC74163 and draw read/write waveforms.
19. Design a Universal shift register using IC 74194/195 and verify its shifting operation.
20. 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;

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ELECTRONIC CIRCUIT ANALYSIS LABARATORY

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 waveformsfind its efficiency
2. Design class B power amplifier and draw the input and output waveforms, find 2^{nd} order andabove harmonics.
3. Prove that the complementary symmetry push pull amplifier eliminate cross over distortion.
4. Design class C power amplifier and draw the input and output waveforms
5. Design a Bistable Multivibrator and analyze the effect of commutating capacitors anddraw the wave forms at base and collector of transistors.
6. Design an Astable Multivibrator and draw the wave forms at base and collector oftransistors.
7. Design a Monostable Multivibrator and draw the input and output waveforms
8. Draw the response of Schmitt trigger for gain of greater than and less than one.
9. Design a Bootstrap sweep circuit using BJT and draw its output time base waveform
10. Design a Miller sweep circuit using BJT and draw its output time base waveform.
11. Prove practically Schmitt Trigger generates square wave

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

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Regulation – R 22

COURSE STRUCTURE

(Applicable for the batch admitted from 2022-23)

II Year Semester II

(For branch EEE)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22ES0EC02	Digital Electronics	3	0	0	3
2	22ES0EC03	Digital Electronics Laboratory	0	0	2	1

(For branch CSO)

S. No	Course Code	Course Title	Hours per Week			Credits
			L	T	P	
1	22PC0EC19	Sensors and Devices	3	0	0	3
2	22PC0EC20	Sensors and Devices Laboratory	0	0	2	1

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R22 B. Tech

DIGITAL ELECTRONICS

B.Tech. II Year II Sem.

L T P C
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Course Objectives: This course aims at a thorough understanding of the binary number system, logic gates, combination logic and synchronous and asynchronous logic.

UNIT - I:

BOOLEAN ALGEBRA AND LOGIC GATES: Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers Number base conversions, signed binary numbers, complements, One's and Two's complement arithmetic, Binary codes (BCD, Gray, Xcess-3)

Boolean Algebra: Basic theorems and properties, canonical and standard forms, Digital logic gates, and Examples of IC gates

UNIT - II:

GATE–LEVEL MINIMIZATION: Standard representation of a logic function, The K-map method, Don't-care conditions, Three-variable, Four-variable K-maps, Q-M method of function realization, SOP & POS simplifications, implementation of a Boolean function using Universal gates.

Exclusive – OR function.

UNIT - III:

COMBINATIONAL LOGIC: Combinational Circuits, Binary Adder-Subtractor, 2-bit Binary multiplier,2-bit magnitude comparator, Decoders, Encoders, Multiplexer,

Demultiplexer, Code Converters (Binary to Gray, Gray to Binary, Xcess-3 to BCD, BCD to Xcess-3)

UNIT - IV:

SEQUENTIAL LOGIC CIRCUITS: Sequential circuits, latches, introduction Flip-Flops, SR, JK, D & T flipflops, state Reduction and Assignment, Registers, shift Registers, Synchronous and Asynchronous Counters, Ring Counter, Johnson Counter.

UNIT – V:

SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read-only memory (ROM), ROM types, Read and write memory (RAM) types, Programmable logic array, Programmable array logic, Sequential Programmable Devices.

TEXTBOOKS:

1. Digital Design – Third Edition, M. Morris Mano, Pearson Education/PHI.
2. Digital Principles and Applications Albert Paul Malvino Donald P. Leach TATA McGraw Hill
Edition.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson.
4. R. P Jain, Modern Digital Electronics, McGraw Hill Education

REFERENCE BOOKS:

1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
2. Switching and Logic Design, C.V.S. Rao, Pearson Education
3. Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition.
4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiquzzaman John Wiley

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DIGITAL ELECTRONICS LAB

B.Tech. II Year II Sem

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Prerequisites: Analog Electronics & Digital Electronics

Course Objectives:

- To learn basic techniques for the design of digital circuits and number conversion systems.
- To implement simple logical operations using combinational logic circuits.
- To design combinational logic circuits, sequential logic circuits.

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

- Understand the working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Analyze different types of semiconductor memories.

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND/NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4-bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
8. Design and realization Asynchronous and Synchronous counters using flip-flops
9. Design and realization 8x1 using 2x1 mux
10. Design and realization 2-bit comparator
11. Verification of truth tables and excitation tables
12. Realization of logic gates using DTL, TTL, ECL, etc.,

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SENSORS AND DEVICES

B.Tech. II Year II Sem.

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Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcomes:

1. Understand IoT value chain structure (device, data cloud), application areas and technologies involved.
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules
3. Market forecast for IoT devices with a focus on sensors
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

UNIT-I:

Introduction to Signals and systems - Brief introduction

Introduction to Internet of Things- Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II:

IoT and M2M- Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT-III:

IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C)

Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

UNIT-IV:

Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT-V:

IoT Physical Servers and Cloud Offerings– Introduction to Cloud Storage models and communication APIs Web Server – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly(SPD), 2014, ISBN: 9789350239759
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, SimonMonk, O'Reilly (SPD), 2016, ISBN 7989352133895

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', RiverPublishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

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SENSORS AND DEVICES LABORATORY

B.Tech. II Year II Sem.

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Prerequisite: Course on Sensors and Devices.

List of Experiments:

1. Connect an LED to GPIO pin 25 and control it through the command line.
2. Connect an LED to GPIO pin 24 and a Switch to GPIO 25 and control the LED with the switch.
3. The state of LED should toggle with every press of the switch Use DHT11 temperature sensorand print the temperature and humidity of the room with an interval of 15 seconds
4. Use joystick and display the direction on the screen
5. Use Light Dependent Resistor (LDR) and control an LED that should switch-on/off dependingon the light.
6. Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycleof 5-2-10 seconds.
7. Switch on and switch of a DC motor based on the position of a switch.
8. Convert an analog voltage to digital value and show it on the screen.
9. Create a door lock application using a reed switch and magnet and give a beep when the dooris opened.
10. Control a 230V device (Bulb) with Raspberry Pi using a relay.
11. Control a 230V device using a threshold temperature, using a temperature sensor.
12. Create an application that has three LEDs (Red, Green and white). The LEDs should follow thecycle (All Off, Red On, Green On, White On) for each clap (use sound sensor).
13. Create a web application for the above applications wherever possible with suitablemodifications to get input and to send output.

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1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti,Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly(SPD), 2014, ISBN: 9789350239759
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