R23-COURSE STRUCTURE – ECE

I-SEMESTER

S. No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
1	23FE01	Communicative English	2	0	0	2	30	70	100
2	23FE04	Engineering Physics	3	0	0	3	30	70	100
3	23FE03	Linear Algebra & Calculus	3	0	0	3	30	70	100
4	23EE01	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
5	23IT51	IT Workshop	0	0	2	1	30	70	100
6	23ME01	Engineering Graphics	2	0	2	3	30	70	100
7	23FE51	Communicative English Lab	0	0	2	1	30	70	100
8	23FE53	Engineering Physics Lab	0	0	2	1	30	70	100
9	23EE51	Electrical and Electronics Engineering Workshop	0	0	3	1.5	30	70	100
10	23AU02	NSS/NCC/Scouts & Guides/Community Service	-	-	-	0.5	100	-	100
Total			**13**	**0**	**11**	**19**	**370**	**630**	**1000**

II-SEMESTER

S. No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
1	23FE02	Chemistry	3	0	0	3	30	70	100
2	23FE05	Differential Equations & Vector Calculus	3	0	0	3	30	70	100
3	23CM01	Basic Civil & Mechanical Engineering	3	0	0	3	30	70	100
4	23CS01	Introduction to Programming	3	0	0	3	30	70	100
5	23EC01	Network Analysis	3	0	0	3	30	70	100
6	23FE52	Chemistry Lab	0	0	2	1	30	70	100
7	23CS51	Computer Programming Lab	0	0	3	1.5	30	70	100
8	23ME51	Engineering Workshop	0	0	3	1.5	30	70	100
9	23EC51	Network Analysis and Simulation Lab	0	0	3	1.5	30	70	100
10	23AU01	Health and Wellness, Yoga and Sports	-	-	-	0.5	100	-	100
Total			**15**	**0**	**11**	**21**	**370**	**630**	**1000**

III- SEMESTER

S. No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
1	23FE12	Probability Theory and Stochastic Process	3	0	0	3	30	70	100
2	23HS01	UHV 2 – Understanding Harmony and Ethical Human Conduct	2	1	0	3	30	70	100
3	23EC02	Signals and Systems	3	0	0	3	30	70	100
4	23EC03	Electronic Devices and Circuits	3	0	0	3	30	70	100
5	23EC04	Switching Theory and Logic Design	3	0	0	3	30	70	100
6	23EC52	Electronic Devices and Circuits Lab	0	0	3	1.5	30	70	100
7	23EC53	Switching Theory and Logic Design Lab	0	0	3	1.5	30	70	100
8	23CSS3	Data Structures using C	0	1	2	2	30	70	100
9	23MC01	Environmental Science	2	-	-	0	30	-	30
Total			**16**	**2**	**08**	**20**	**270**	**560**	**830**

IV- SEMESTER

S. No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
1	23HS02	Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
2	23EE09	Control Systems	3	0	0	3	30	70	100
3	23EC05	Electromagnetic Waves and Transmission Lines	3	0	0	3	30	70	100
4	23EC06	Electronic Circuit Analysis	3	0	0	3	30	70	100
5	23EC07	Analog Communications	3	0	0	3	30	70	100
6	23EC54	Signals and Systems Lab	0	0	3	1.5	30	70	100
7	23EC55	Electronic Circuit Analysis Lab	0	0	3	1.5	30	70	100
8	23CSS1	Python Programming	0	1	2	2	30	70	100
9	23ME57	Design Thinking & Innovation	1	0	2	2	30	70	100
Total			**15**	**1**	**10**	**21**	**270**	**630**	**900**
Mandatory Community Service Project Internship of 08 weeks' duration during summer vacation									

V- SEMESTER

S.No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
THEORY COURSES									
1	23EC08	Analog & Digital IC Applications	3	0	0	3	30	70	100
2	23EC09	Digital Communications	3	0	0	3	30	70	100
3	23EC10	Antennas and Wave Propagation	3	0	0	3	30	70	100
4	**PROGRAM ELECTIVE – I**		3	0	0	3	30	70	100
	23EC11	Computer Organization and Architecture							
	23EC12	Digital System Design through HDL							
	23EC13	Electronic Measurements and Instrumentation							
	23EC14	Optical Communications							
5	**OPEN ELECTIVE – I**		3	0	0	3	30	70	100
LABORATORY COURSES									
6	23EC56	Analog & Digital IC Applications Lab	0	0	3	1.5	30	70	100
7	23EC57	Analog & Digital Communications Lab	0	0	3	1.5	30	70	100
8	23EC58	Design and Simulation of Antennas Lab	0	0	2	1	30	70	100
9	23ECS2	Idea Implementation Lab	0	1	2	2	30	70	100
10	23PI01	Evaluation of Community Service Internship	-	-	-	2	-	50	50
Total			**15**	**1**	**10**	**23**	**270**	**680**	**950**

VI- SEMESTER

S.No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
THEORY COURSES									
1	23EC15	VLSI Design	3	0	0	3	30	70	100
2	23EC16	Microprocessors & Microcontrollers	3	0	0	3	30	70	100
3	23EC17	Digital Signal Processing	3	0	0	3	30	70	100
4	**PROGRAM ELECTIVE – II**		3	0	0	3	30	70	100
	23EC18	Analog IC Design							
	23EC19	Satellite Communication							
	23EC20	Smart and Wireless Instrumentation							
	23EC21	Data Communications and Networks							
5	**PROGRAM ELECTIVE – III**								
	23EC22	Bio Medical Instrumentation	3	0	0	3	30	70	100
	23EC23	Microwave Engineering							
	23EC24	Embedded Systems							
	23EC25	Sensors and Actuators							
6	**OPEN ELECTIVE – II**		3	0	0	3	30	70	100
LABORATORY COURSES									
7	23EC59	VLSI Design Lab	0	0	3	1.5	30	70	100
8	23EC60	Microprocessors & Microcontrollers Lab	0	0	3	1.5	30	70	100
9	23HSS1	Soft Skills	0	1	2	2	30	70	100
10	23MC03	Research Methodology and IPR	2	0	0	-	30	-	30
Total			**20**	**1**	**8**	**23**	**300**	**630**	**930**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

OPEN ELECTIVES

Course Code	Course Name	Offered to the branches
23AD81	Introduction to Artificial Intelligence	ASE, CE, ECE,EEE & ME
23AD82	Fundamentals of Data Science	ASE, CE, ECE,EEE & ME
23AD83	Introduction to Cloud Computing	ASE, CE, ECE,EEE & ME
23AD84	Data Analytics	ASE, CE, ECE,EEE & ME
23AE81	PRINCIPLES OF FLIGHT	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE82	SPACE SCIENCE	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE83	AIRCRAFT INSTRUMENTATION	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE84	AIR TRANSPORTATION SYSTEMS	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AM81	Python Programming for AI & ML	ASE, CE, ECE,EEE & ME
23AM82	AI in healthcare	ASE, CE, ECE,EEE & ME
23AM83	Fundamentals of Machine Learning	ASE, CE, ECE,EEE & ME
23AM84	Introduction to Deep learning	ASE, CE, ECE,EEE & ME
23CE81	Disaster Management	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE82	Climate change impact on Eco system	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE83	Environmental Sanitation	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE84	Introduction to Remote Sensing and GIS	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE85	Water Supply Systems	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE86	Sustainability in Engineering Practices	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CS81	Introduction to Java Programming	ASE, CE, ECE,EEE & ME
23CS82	Principles of Operating Systems	ASE, CE, ECE,EEE & ME
23CS83	Principles of Database Management Systems	ASE, CE, ECE,EEE & ME
23CS83	Principles of Database Management Systems	ASE, CE, ECE,EEE & ME
23CS84	IoT based smart Systems	ASE, CE, ECE,EEE & ME
23EC81	Linear and Digital IC Applications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC82	Principles of communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC83	Fundamentals of VLSI Design	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC84	Principles of Cellular & Mobile communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC85	Fundamentals of Satellite Communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Course Code	Course Name	Offered to the branches
23EE81	Basic Control System	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE82	Basic Electrical Measurements	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE83	Utilization of Electrical Energy	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE84	Electric Vehicles	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE85	Concepts of Energy Auditing & Management	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE86	Electrical Wiring Estimation and Costing	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23IT81	Computer System Architecture	ASE, CE, ECE,EEE & ME
23IT82	Introduction to Programming in Java	ASE, CE, ECE,EEE & ME
23IT83	Principles of Software Engineering	ASE, CE, ECE,EEE & ME
23ME81	Sustainable Energy Technologies	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME82	Introduction to Industrial Robotics	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME83	Applied Operations Research	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME84	Entrepreneurship	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME85	Additive Manufacturing	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME86	Vehicle Technology	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT

23FE01 – COMMUNICATIVE ENGLISH

B. Tech. (I Sem.)

L	T	P	Cr.
2	0	0	2

COURSE OBJECTIVES:

The main objective of introducing this course, *Communicative English,* is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready

COURSE OUTCOMES:

CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues**. (Understand – L2)**

CO2: Apply grammatical structures to formulate sentences and correct word Forms. **(Apply – L3)**

CO3: Use discourse markers to speak clearly on a specific topic in informal Discussions. **(Apply – L3)**

CO4: Read / Listen the texts and write summaries based on global comprehension of these texts. **(Understand – L2)**

CO5: Prepare a coherent paragraph, essay, and resume. **(Apply – L3)**

UNIT-I: Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions **Vocabulary:** Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT-II: Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.

Vocabulary: Homonyms, Homophones, Homographs.

UNIT-III: Lesson: BIOGRAPHY: Elon Musk
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT-IV: Lesson: INSPIRATION: The Toys of Peace by Saki
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters, Resumes
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

UNIT-V: Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Writing: Writing structured essays on specific topics.
Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

TEXTBOOKS:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

REFERENCE BOOKS:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge,2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

WEB RESOURCES:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY:

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

23FE04 – ENGINEERING PHYSICS

B. Tech. (I Sem.)

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc., enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

COURSE OUTCOMES:

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

CO1: Analyze the intensity variation of light due to interference, diffraction, and Polarization. **(Apply – L3).**

CO2: Understand the basics of crystals and their structures -**(Understand – L2).**

CO3: Summarize various types of polarization of dielectrics and classify the magnetic materials **(Understand – L2)**

CO4: Explain fundamentals of quantum mechanics and free electron theory of metals- **(Understand).**

CO5: Identify the type of semiconductor using Hall Effect- **(Apply).**

UNIT-I: Wave Optics Interference:

Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism

-Half wave and Quarter wave plates.

UNIT-II: Crystallography and X-ray Diffraction Crystallography:

Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes. X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT-III: Dielectric and Magnetic Materials:

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic

materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT-IV: Quantum Mechanics and Free Electron Theory:

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy.

UNIT-V: Semiconductors:

Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

TEXTBOOKS:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P. G. Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D. K. Bhattacharya and Poonam Tandon, Oxford press (2015)

REFERENCE BOOKS:

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

WEB RESOURCES:

https://www.loc.gov/rr/scitech/selected-internet/physics.html

23FE03 – LINEAR ALGEBRA & CALCULUS

B. Tech. (I Sem.)

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

COURSE OUTCOMES:

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

CO1: Apply matrix algebra techniques to solve engineering problems. **(Apply – L3)**

CO2: Use Eigen values and Eigen vectors concept to find nature of quadratic form, inverse and powers of matrix. **(Apply – L3)**

CO3: Expand various functions using Mean value theorems. **(Understand – L2)**

CO4: Understand the concepts of functions of several variables which are useful in optimization. **(Understand – L2)**

CO5: Evaluate areas and volumes by using double and triple integrals. **(Apply – L3)**

UNIT-I: Matrices

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II: Eigenvalues, Eigenvectors and Orthogonal Transformation

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley- Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley- Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III: Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT IV: Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V: Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXTBOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

REFERENCE BOOKS:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5thEdition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9thedition
5. Higher Engineering Mathematics H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021)

B. Tech. (I Sem.)

23EE01 – BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

COURSE OUTCOMES:

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

CO1: Extract electrical variables of AC & DC circuits using fundamental laws. **(Understand – L2)**

CO2: Understand the operation of electrical machines and measuring instruments. **(Understand – L2)**

CO3: Classify various energy resources, safety measures and interpret electricity bill generation in electrical systems. **(Understand – L2)**

CO4: Interpret the characteristics of various semiconductor devices **(Understand – L2)**

CO5: Infer the operation of rectifiers, amplifiers. **(Understand – L2)**

CO6: Contrast various logic gates, sequential and combinational logic circuits. **(Understand – L2)**

PART A: BASIC ELECTRICAL ENGINEERING

UNIT-I: DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL &KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT-II: Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III: Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two- part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

TEXTBOOKS:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

REFERENCE BOOKS:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019,Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S. Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Pearson Publications, 2018, Second Edition.

WEB RESOURCES:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

COURSE OBJECTIVES:

To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

UNIT-I: SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT-II: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT-III: DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

TEXTBOOKS:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

REFERENCE BOOKS:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

END EXAMINATION PATTERN:

1. Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35marks each.
2. In each part, question 1 shall contain 5 compulsory short answer questions for a total of5 marks such that each question carries 1 mark.
3. In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
4. The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

23IT51 – IT WORKSHOP

B. Tech. (I Sem.)

L	T	P	Cr.
0	0	2	1

COURSE OBJECTIVES:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, spread sheets and Presentation tools.

COURSE OUTCOMES:

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

CO1: Identify the components of a PC and troubleshooting the malfunctioning of PC. **(Apply – L3)**

CO2: Develop presentation /documentation using Office tools and LaTeX. **(Apply – L3)**

CO3: Build dialogs and documents using ChatGPT. **(Apply – L3)**

CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values. **(Apply – L3)**

PC HARDWARE & SOFTWARE INSTALLATION:

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

INTERNET & WORLD WIDE WEB:

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD:

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered: - Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL:

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS)tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP:

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT:

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc.), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT:

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

REFERENCE BOOKS:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech,2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

23ME01 – ENGINEERING GRAPHICS

B. Tech. (I Sem.)

L	T	P	Cr.
2	0	2	3

COURSE OBJECTIVES:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

COURSE OUTCOMES:

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

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections **(Understand – L2)**

CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views **(Apply – L3)**

CO3: Understand and draw projection of solids in various positions in first quadrant. **(Apply – L3)**

CO4: Explain principles behind development of surfaces. **(Apply – L3)**

CO5: Prepare isometric and orthographic sections of simple solids. **(Apply – L3)**

UNIT I: Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. **(Covered theoretically in class. Not for the end examination)**

Scales: Plain scales, diagonal scales and vernier scales. **(Covered theoretically in class. Not for the end examination)**

Curves: construction of ellipse, parabola and hyperbola by general method only, Cycloids, Involutes, Normal and tangent to Curves.

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

UNIT II: Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

Projections of Planes: Regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane.

UNIT III: Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV: Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.
Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V: Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.
Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD **(*Not for end examination*).**

TEXTBOOK:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

REFERENCE BOOKS:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M. B. Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

23FE51 – COMMUNICATIVE ENGLISH LAB

B. Tech. (I Sem.)

L	T	P	Cr.
0	0	2	1

COURSE OBJECTIVES:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

COURSE OUTCOMES:

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

CO1: Understand the different aspect of the English language proficiency with emphasis on LSRW skills **(Understand – L2)**

CO2: Apply Communication Skills through various language learning activities. **(Apply – L3)**

CO3: Identifying the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking, comprehension. **(Understand – L2)**

CO4: Exhibit professionalism in participating in debates and group discussions. **(Apply – L3)**

LIST OF TOPICS:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

SUGGESTED SOFTWARE:

- Walden Infotech
- Young India Films

REFERENCE BOOKS:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India,2016
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012

WEB RESOURCES:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

23FE53 – ENGINEERING PHYSICS LAB

B. Tech. (I Sem.)

L	T	P	Cr.
0	0	2	1

COURSE OBJECTIVES:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

COURSE OUTCOMES:

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

CO1: Analyze the wave properties of light using optical instruments **(Apply – L3).**

CO2: Estimate the elastic modulii of various materials and acceleration due to gravity **(Apply – L3).**

CO3: Demonstrate the vibrations in stretched strings **(Understand – L2).**

CO4: Evaluate dielectric constant and magnetic field of circular coil carrying current **(Apply – L3).**

CO5: Examine the characteristics of semiconductor devices **(Apply – L3).**

LIST OF EXPERIMENTS:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

REFERENCES:

- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

WEB RESOURCES:

- www.vlab.co.in
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

B. Tech. (I Sem.)

23EE51 – ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP

L	T	P	Cr.
0	0	3	1.5

COURSE OBJECTIVES:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

COURSE OUTCOMES:

At the end of this course, the student will be able to

CO1: Compute voltage, current and power in an electrical circuit. **(Apply – L3)**
CO2: Compute medium resistance using Wheat stone bridge. **(Apply – L3)**
CO3: Discover critical field resistance and critical speed of DC shunt generators. **(Apply – L3)**
CO4: Estimate reactive power and power factor in electrical loads. **(Understand – L2)**
CO5: Plot the characteristics of semiconductor devices. **(Apply – L3)**
CO6: Demonstrate the working of various logic gates using ICs. **(Understand – L2)**

ACTIVITIES:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set,wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by thestudents.
3. **Components:**
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
   - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

LIST OF EXPERIMENTS:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

REFERENCE BOOKS:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

COURSE OBJECTIVES:

To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

LIST OF EXPERIMENTS:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gatesusing ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

TOOLS / EQUIPMENT REQUIRED:

DC Power supplies, Multi meters, DC Ammeters, DC Volt meters, AC Voltmeters, CROs, all the required active devices.

REFERENCES:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

B. Tech. (I Sem.)

23AU02 – NSS/NCC/SCOUTS & GUIDES/ COMMUNITY SERVICE PROJECTS

L	T	P	Cr.
0	0	1	0.5

COURSE OBJECTIVES:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES:

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

CO1: Understand the importance of discipline, character and service motto.
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3: Explore human relationships by analyzing social problems.
CO4: Determine to extend their help for the fellow beings and downtrodden people.
CO5: Develop leadership skills and civic responsibilities.

UNIT-I: Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

ACTIVITIES:

1. Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
2. Conducting orientations programs for the students –future plans-activities- releasing road map etc.
3. Displaying success stories-motivational biopics- award winning movies on societal issues etc.
4. Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT-II: Nature & Care Activities:

1. Best out of waste competition.
2. Poster and signs making competition to spread environmental awareness.
3. Recycling and environmental pollution article writing competition.
4. Organizing Zero-waste day.
5. Digital Environmental awareness activity via various social media platforms.
6. Virtual demonstration of different eco-friendly approaches for sustainable living.
7. Write a summary on any book related to environmental issues.

23FE02 – CHEMISTRY

B. Tech. (II Sem.)

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

COURSE OUTCOMES:

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

CO1: Understand the fundamentals of quantum mechanics and molecular orbital energy diagrams for molecules. **(Understand – L2)**

CO2: Summarize the suitability of advanced materials like semiconductors, superconductors, super capacitors and Nano materials, in advanced fields. **(Understand – L2)**

CO3: Apply Nernst equation in calculating cell potentials and understand conduct metric, potentiometric titrations, electrochemical sensors and compare batteries for different applications. **(Understand – L2)**

CO4: Outline the importance of polymers and conducting polymers in advanced technologies. **(Understand – L2)**

CO5: Understand the fundamentals of UV-Visible, IR spectroscopic techniques and basic principles of chromatographic techniques. **(Understand – L2)**

UNIT-I: Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT-II: Modern Engineering materials

Semiconductors – Introduction, basic concept, application Super Conductors-Introduction basic concept, applications.

Super capacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT-III: Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT-IV: Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), PolyI Lactic Acid (PLA).

UNIT-V: Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

TEXTBOOKS:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

B. Tech. (II Sem.)

23FE05 – DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

COURSE OUTCOMES:

At the end of the course, the student will be to

CO1: Solve the differential equations related to various engineering fields (Unit – I&II). **(Apply – L3)**

CO2: Apply knowledge of partial differentiation in modelling and solving of Partial differential equations. **(Apply – L3)**

CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence. **(Apply – L3)**

CO4: Evaluate the work done against a field, circulation and flux using Vector Calculus. **(Apply – L3)**

UNIT-I: Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT-II: Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT-III: Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT-IV: Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions- Divergence and Curl, vector identities.

UNIT-V: Vector integration

LWithoutegral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

TEXTBOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition.

REFERENCE BOOKS:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018,5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B

B. Tech. (II Sem.)

23CM01 – BASIC CIVIL & MECHANICAL ENGINEERING

L	T	P	Cr.
3	0	0	3

PART A: BASIC CIVIL ENGINEERING

COURSE OBJECTIVES:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

Course Outcomes:

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

CO1: Summarize the different manufacturing processes. **(Understand – L2)**

CO2: Explain the basics of thermal engineering and its applications. **(Understand – L2)**

CO3: Illustrate the working of different mechanical power transmission systems and power plants. **(Understand – L2)**

CO4: Describe the basics of robotics and its applications. **(Understand – L2)**

UNIT-I: Basics of Civil Engineering:

Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-Technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated Construction Techniques.

UNIT-II: Surveying:

Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and Bearings- Contour mapping.

UNIT-III: Transportation Engineering

Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

TEXTBOOKS:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt.Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers.2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

REFERENCE BOOKS:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S. K. Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

COURSE OBJECTIVES:

The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Summarize the different manufacturing processes. **(Understand – L2)**

CO2: Explain the basics of thermal engineering and its applications. **(Understand – L2)**

CO3: Illustrate the working of different mechanical power transmission systems and power plants. **(Understand – L2)**

CO4: Describe the basics of robotics and its applications. **(Understand – L2)**

UNIT-I: Introduction to Mechanical Engineering:

Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT-II: Manufacturing Processes:

Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT-III: Power plants

Working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(**Note:** The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject.)

TEXTBOOKS:

1. Internal Combustion Engines by V. Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engineering by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

REFERENCE BOOKS:

1. G. Shanmugam and M. S. Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.
2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
4. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

B. Tech. (II Sem.)

23CS01 – INTRODUCTION TO PROGRAMMING

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

COURSE OUTCOMES:

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

CO1: Understand basics of computers, concept of algorithms and flowcharts. (**Understand – L2)**

CO2: Understand the features of C language. (**Understand – L2**)

CO3: Interpret the problem and develop an algorithm to solve it. (**Apply – L3**)

CO4: Implement various algorithms using the C programming language. (**Apply – L3**)

CO5: Develop skills required for problem-solving and optimizing the code (**Apply – L3)**

UNIT I: Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT-II: Control Structures

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT-III: Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT-IV: Pointers & User Defined Data types

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT: Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Life time of variables, Basics of File Handling

Note: The syllabus is designed with C Language as the fundamental language of implementation**.**

TEXTBOOKS:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education,1996

REFERENCE BOOKS:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw- Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

23EC01 – NETWORK ANALYSIS

B. Tech. (II Sem.)

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

- To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
- To impart knowledge on applying appropriate theorem for electrical circuit analysis
- To explain transient behavior of circuits in time and frequency domains
- To teach concepts of resonance
- To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to

CO1: Apply fundamental laws and theorems to compute electrical variables of DC circuits **(Apply – L3)**

CO2: Analyze electrical networks during transients in the Laplace domain **(Apply – L3)**

CO3: Apply fundamental laws and theorems to compute electrical variables of AC electricalcircuits **(Apply – L3)**

CO4: Analyze resonance circuits **(Analyze – L4)**

CO5: Evaluate variables associated with magnetic circuits **(Apply – L3)**

CO6: Compute the parameters of a two-port network **(Apply – L3)**

UNIT-I: Types of circuit components

Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principle of Duality with examples.

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens - problem solving using dependent sources also.

UNIT-II: Transients:

First order differential equations, Definition of time constants, R-L circuit, R- C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation ofroots.

Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

UNIT-III: Steady State Analysis of A.C Circuits:

Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.

UNIT-IV: Resonance:

Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.

Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT-V: Two-port Networks:

Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between Parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also.

Image and iterative impedances: Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching networks.

TEXTBOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.
3. Network lines and Fields by John. D. Ryder 2nd Edition, PHI

REFERENCE BOOKS:

1. D. Roy Choudhury, Networks and Systems, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education.

23FE52 – CHEMISTRY LAB

B. Tech. (II Sem.)

L	T	P	Cr.
0	0	2	1

COURSE OBJECTIVES:

Verify the fundamental concepts with experiments.

COURSE OUTCOMES:

At the end of the course, the students will be able to

CO1: Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus. **(Analyze – L4)**

CO2: Acquire practical knowledge related to preparation of bakelite and nanomaterials. (**Apply – L3)**

CO3: Measure the strength of acid present in Pb-Acid battery. **(Apply – L3)**

CO4: Determine the cell constant and conductance of solutions. **(Apply – L3)**

CO5: Analyze organic compounds by using UV-Visible and IR spectroscopy. **(Apply – L3)**

LIST OF EXPERIMENTS

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

REFERENCE:

- "Vogel's Quantitative Chemical Analysis 6th Edition" Pearson Publications by J. Mendham, R. C. Denney, J. D. Barnes and B. Sivasankar

23CS51 – COMPUTER PROGRAMMING LAB

B. Tech. (II Sem.)

L	T	P	Cr.
0	0	3	1.5

COURSE OBJECTIVES:

The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

COURSE OUTCOMES:

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

CO1: Read, understand, and trace the execution of programs written in C language. (**Understand – L2)**

CO2: Apply the right control structure for solving the problem. (**Apply – L3**)

CO3: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, pointers and files in C. (**Apply – L3**)

CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values. (**Apply – L3**)

UNIT-I

WEEK-1:

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

1. Basic Linux environment and its editors like Vi, Vim & Emacs etc.
2. Exposure to Turbo C, gcc
3. Writing simple programs using printf(), scanf()

WEEK-2:

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

1. Sum and average of 3 numbers
2. Conversion of Fahrenheit to Celsius and vice versa
3. Simple interest calculation

WEEK-3:

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

1. Finding the square root of a given number
2. Finding compound interest
3. Area of a triangle using heron's formulae
4. Distance travelled by an object

UNIT-II

WEEK-4:

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

1. Evaluate the following expressions
    a. A+B*C+(D*E) + F*G
    b. A/B*C-B+A*D/3
    c. A+++B---A
    d. J= (i++) + (++i)
2. Find the maximum of three numbers using conditional operator
3. Take marks of 5 subjects in integers, and find the total, average in float

WEEK-5:

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

1. Write a C program to find the max and min of four numbers using if-else.
2. Write a C program to generate electricity bill.
3. Find the roots of the quadratic equation.
4. Write a C program to simulate a calculator using switch case.
5. Write a C program to find the given year is a leap year or not.

WEEK-6:

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

1. Find the factorial of given number using any loop.
2. Find the given number is a prime or not.
3. Compute sine and cos series
4. Checking a number palindrome
5. Construct a pyramid of numbers.

UNIT-III

WEEK-7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1- D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search

1. Find the min and max of a 1-D integer array.
2. Perform linear search on1D array.
3. The reverse of a 1D integer array
4. Find 2's complement of the given binary number.
5. Eliminate duplicate elements in an array.

WEEK-8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

1. Addition of two matrices
2. Multiplication two matrices
3. Sort array elements using bubble sort
4. Concatenate two strings without built-in functions
5. Reverse a string using built-in and without built-in string functions

UNIT-IV

WEEK-9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C **Suggested Experiments/Activities:**

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

1. Write a C program to find the sum of a 1D array using malloc()
2. Write a C program to find the total, average of n students using structures
3. Enter n students data using calloc() and display failed students list
4. Read student name and marks from the command line and display the student details along with the total.

WEEK-10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures(Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

1. Create and display a singly linked list using self-referential structure.
2. Demonstrate the differences between structures and unions using a C program.
3. Write a C program to shift/rotate using bitfields.
4. Write a C program to copy one structure variable to another structure of the same type.

UNIT-V

WEEK-11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

1. Write a C function to calculate NCR value.
2. Write a C function to find the length of a string.
3. Write a C function to transpose of a matrix.
4. Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK-12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

1. Write a recursive function to generate Fibonacci series.
2. Write a recursive function to find the lcm of two numbers.
3. Write a recursive function to find the factorial of a number.
4. Write a C Program to implement Ackermann function using recursion.
5. Write a recursive function to find the sum of series.

WEEK-13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers **Suggested Experiments/Activities:**

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

1. Write a C program to swap two numbers using call by reference.

2. Demonstrate Dangling pointer problem using a C program.
3. Write a C program to copy one string into another using pointer.
4. Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK-14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

1. Write a C program to write and read text into a file.
2. Write a C program to write and read text into a binary file using fread() and fwrite()
3. Copy the contents of one file to another file.
4. Write a C program to merge two files into the third file using command-line arguments.
5. Find no. of lines, words and characters in a file
6. Write a C program to print last n characters of a given file.

TEXTBOOKS:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

23ME51 – ENGINEERING WORKSHOP

B. Tech. (II Sem.)

L	T	P	Cr.
0	0	3	1.5

COURSE OBJECTIVES:

To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

COURSE OUTCOMES:

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

CO1: Identify workshop tools and their operational capabilities. **(Understand – L2)**

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding. **(Apply – L3)**

CO3: Modal various basic prototypes in fitting trade. **(Apply – L3)**

CO4: Apply basic electrical engineering knowledge for House Wiring Practice **(Apply – L3)**

SYLLABUS

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in woodworking and make following joints.
   a. Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metalworking, Developments of following sheet metal job from GI sheets.
   a. Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a. V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and makethe following connections.
   a. Parallel and series b) Two-way switch c) Godown lighting
   d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Basic repairs of Two-wheeler vehicle – Demonstration of working of two-wheeler vehicle and its repairs.

TEXTBOOKS:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edition. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

REFERENCE BOOKS:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22

B. Tech. (II Sem.)

23EC51 – NETWORK ANALYSIS AND SIMULATION LAB

L	T	P	Cr.
0	0	3	1.5

COURSE OBJECTIVES:

- To gain hands on experience in verifying Kirchoff's laws and network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters

COURSE OUTCOMES:

CO1: Demonstrate fundamental circuit laws, network theorems, node and mesh analysis of electrical circuits **(Apply – L3).**

CO2: Design resonance circuit for given specifications **(Analyze – L4).**

CO3: Measure time constants of RL & RC circuits **(Apply – L3).**

CO4: Analyze the 1st and 2nd order circuits with respect to parameter variation **(Analyze – L4).**

CO5: Characterize and model the network in terms of all network parameters **(Apply – L3).**

The following experiments need to be performed using both Hardware and simulation Software.

The experiments need to be simulated using software and the same need to be verified using the hardware.

1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits
4. Verification of maximum power transfer theorem for AC circuits
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Study of DC transients in RL, RC and RLC circuits
7. To study frequency response of various 1st order RL & RC networks
8. To study the transient and steady state response of a 2nd order circuit by varying its various parameters and studying their effects on responses
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
10. Determination of open circuit (Z) and short circuit (Y) parameters
11. Determination of hybrid (H) and transmission (ABCD) parameters
12. To measure two port parameters of a twin-T network and study its frequency response.

HARDWARE REQUIREMENTS:

Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components

SOFTWARE REQUIREMENTS:

Multisim/ Pspice /Equivalent simulation software tool, Computer Systems with required specifications

REFERENCES:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.

B. Tech. (II Sem.)

23AU01 – HEALTH AND WELLNESS, YOGA AND SPORTS

L	T	P	Cr.
0	0	1	0.5

COURSE OBJECTIVES:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES:

At the end of the course the student will be able to:

CO1: Understand the importance of yoga and sports for Physical fitness and sound health. **(Understand – L2)**

CO2: Demonstrate an understanding of health-related fitness components. **(Understand – L2)**

CO3: Compare and contrast various activities that help enhance their health. **(Understand – L2)**

CO4: Assess current personal fitness levels. **(Apply – L3)**

CO5: Develop Positive Personality **(Apply – L3)**

UNIT-I:

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

Activities:

1. Organizing health awareness programmes in community
2. Preparation of health profile
3. Preparation of chart for balance diet for all age groups

UNIT-II:

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT-III:

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

1. Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
2. Practicing general and specific warm up, aerobics
3. Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

REFERENCE BOOKS:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022
2. T. K. V. Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J. Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

GENERAL GUIDELINES:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as manyas Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

EVALUATION GUIDELINES:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.

A student shall be evaluated by the concerned teacher for 10 marks by conducting viva-voce on the subject

B. Tech. (III Sem.)

23FE12 – PROBABILITY THEORY AND STOCHASTIC PROCESS

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Summarize the basic concepts of Probability and Random Processes. (**Understand – L2**)

CO2: Examine the Spectral and temporal characteristics of Random Signals. (**Apply – L3**)

CO3: Analyze Linear Time Invariant systems driven by stationary random process by using Auto correlation function and Power spectral Density. (**Analyze – L4**)

CO4: Interpret the concepts of Noise and Information theory in Communication systems (**Understand – L2**)

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,

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 (Derivation not expected), Characteristic Function, Moment Generating Function (Proofs are not expected for properties of both Characteristic Function and Moment Generating Function), Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, 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 (Proof not expected for properties).

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, 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 (Proof Not expected). 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 (Proof not expected).

TEXT BOOKS:

1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles, 4 th 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.
5. Y Mallikarjuna Reddy, “Probability theory and Stochastic Processes”, Universities Press (India), Pvt Ltd.

ONLINE LEARNING RESOURCES:

1. https://nptel.ac.in/courses/111102111
2. https://ocw.mit.edu/courses/6-262-discrete-stochastic-processes-spring-011/resources/lecture-1-introduction-and-probability-review/

B. Tech. (III Sem.)

23HS01 – UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

COURSE OUTCOMES:

CO1: Describe the terms like Natural Acceptance, Happiness and Prosperity (**L2**)
CO2: Identify one's self, and one's surroundings (family, society nature) (**L2**)
CO3: Relate human values with human relationship and human society. (**L2**)
CO4: Illustrate the need for universal human values and harmonious existence (**L2**)
CO5: Develop as socially and ecologically responsible engineers (L3)

Course Topics The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions. The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT – I: Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT – II: Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT – III: Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal.

UNIT – IV: Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT – V: Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

TEXTBOOK AND TEACHERS MANUAL

A. THE TEXTBOOK

1. R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

B. **THE TEACHER'S MANUAL**

1. R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

MODE OF CONDUCT:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions. While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements. In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values. It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department. Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

ONLINE RESOURCES:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

23EC02 – SIGNALS AND SYSTEMS

B. Tech. (III Sem.)

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

- To study about signals and systems.
- To analyze the spectral characteristics of signal.
- To understand the characteristics of systems.
- To introduce the concept of sampling process.
- To know various transform techniques to analyze the signals and systems.

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Summarize the basic concepts of signals, systems and sampling (**Understand – L2**)

CO2: Examine the operations on signals and approximate using orthogonal functions (**Apply – L3**)

CO3: Apply the concept of impulse response to analyze the linear time invariant systems (**Apply – L3**)

CO4: Analyze both continuous time and discrete time signals and systems using Fourier series, Fourier transform, Laplace transforms and Z Transforms (**Analyze – L4**)

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time- scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. 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. Related problems.

UNIT–II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function and Related problems, Introduction to Hilbert Transform.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS: Introduction**,** Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV)system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal band width, system band width, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT–IV: CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

SAMPLINGTHEOREM: 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, Related problems.

UNIT–V: LAPLACE TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

Z–TRANSFORMS: Concept of Z-Transform of a discrete sequence. Region of convergence in Z- Transform, constraints on ROC for various classes of signals, Inverse Z- transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z-transforms.

TEXTBOOKS:

1. Signals, Systems & Communications-B. P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn,1997
3. Signals & Systems-Simon Haykin and VanVeen, Wiley, 2ndEdition, 2007

REFERENCE BOOKS:

1. Principles of Linear Systems and Signals–BP Lathi, Oxford University Press,2015
2. Signals and Systems–TK Rawat, Oxford University press,2011
3. P. Ramesh Babu, R.Ananda Natarajan "Signals and Systems", Scitech Publications, 2 nd edition,2006.

ONLINE LEARNING RESOURCES:

1. https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/video_galleries/video-lectures/
2. https://archive.nptel.ac.in/courses/108/104/108104100/

B. Tech. (III Sem.)

23EC03 – ELECTRONIC DEVICES AND CIRCUITS

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

- To learn and understand the basic concepts of semiconductor physics.
- To know the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- To acquire the knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transistor biasing and its significance.
- To learn the small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

COURSE OUTCOMES:

At the end of this course the student will able to:

CO 1: Identify the fundamentals of semiconductor physics necessary for electronic devices and circuits **(Remember – L1)**

CO 2: Illustrate the structure and operation of Diodes, Bipolar Junction Transistors, Field Effect Transistors and biasing of BJT & FET using fundamental circuits. **(Understand – L2)**

CO 3: Apply the knowledge of Diodes, Transistors and Filters for designing the Rectifiers, Regulators and Amplifier circuits using basic components. **(Apply – L3)**

CO 4: Analyze the characteristics of Diodes, Bipolar Junction Transistors, Field Effect Transistors and their equivalent models using V-I Characteristics. **(Analyze – L4)**

UNIT-I: Review of Semiconductor Physics: Mobility and Conductivity, Intrinsic and extrinsic semiconductors**, C**ontinuity Equation, Law of Junction. **(Text book: 1)**

Junction Diode Characteristics: Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in p-n junction Diode, Diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance. **(Text book: 1)**

Special Semiconductor Devices: Zener Diode, Breakdown Mechanisms, Zener Diode Applications, Varactor Diode, LED, Photodiode, Tunnel Diode, UJT, PNPN Diode, SCR, Construction, Operation and V-I Characteristics. **(Text book: 1)**

UNIT-II: Diode Circuits: The Diode as a circuit element, The Load-Line concept, The Piecewise Linear Diode Model, Clipping (limiting) Circuits, Clipping at Two Independent Levels, Peak Detector, Clamping circuits, Comparators, Sampling Gate, Basic Rectifier Setup**,** Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Derivations of Characteristics of Rectifiers, Filters, Inductor Filter, Capacitor Filter, π-Section Filter, Comparison of various Filter Circuits in terms of Ripple Factors. **(Text book: 1, 2)**

UNIT- III: Transistor Characteristics: Junction transistor, transistor current components, transistor equation in CB configuration, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values. **(Text book: 1)**

Transistor Biasing and Thermal Stabilization: Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability. **(Text book: 1)**

UNIT- IV: Small Signal Low Frequency Transistor Amplifier Models

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers. **(Text book: 1, 2)**

UNIT- V: FET: FET types, JFET operation, characteristics, small signal model of JFET. **(Text book: 1)**

MOSFET: MOSFET Structure, Operation of MOSFET: operation in triode region, operation in saturation region, MOSFET as a variable resistor, derivation of V-I characteristics of MOSFET, Channel length modulation, MOS transconductance, MOS device models: MOS small signal model, PMOS Transistor, CMOS Technology, Comparison of Bipolar and MOS devices. **(Text book: 3)**

CMOS amplifiers: General Considerations, Common Source Stage, Common Gate Stage, Source Follower, comparison of FET amplifiers. **(Text book: 3)**

TEXT BOOKS:

1. Millman's Electronic Devices and Circuits- J. Millman, C. C. Halkias and Satyabrata Jit, Mc-Graw Hill Education, 4th edition, 2015.
2. Millman's Integrated Electronics-J. Millman, C. Halkias, and Ch. D. Parikh, Mc-Graw Hill Education, 2nd Edition, 2009.
3. Fundamentals of Microelectronics-Behzad Razavi, Wiley, 3rd edition, 2021.

REFERENCE BOOKS:

1. Basic Electronics-Principles and Applications, Chinmoy Saha, Arindam Halder, Debarati Ganguly, Cambridge University Press, 1st edition, 2018.
2. Electronics devices & circuit theory- Robert L.Boylestad and Louis Nashelsky, Pearson, 11th edition, 2015.
3. Electronic Devices and Circuits - David A. Bell, Oxford University Press, 5th edition, 2008.

ONLINE LEARNING RESOURCES:

1. https://nptel.ac.in/courses/108108112
2. https://nptel.ac.in/courses/108101091
3. https://nptel.ac.in/courses/108102095

B. Tech. (III Sem.)

23EC04 – SWITCHING THEORY AND LOGIC DESIGN

L	T	P	Cr.
3	0	0	3

COURSE OBJECTIVES:

- To solve a typical number base conversion and analyze new error coding techniques.
- To understand the behavior of logic gates by using theorems and functions of Boolean algebra.
- To optimize logic gates for digital circuits using various techniques.
- To perform Boolean function simplification using Karnaugh maps and Quine-McCluskey methods.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Summarize the key differences between number systems and their usage in Digital Circuits. **(Understand – L2).**

CO2: Identify the minimization techniques of Boolean expressions to implement Digital Circuits using basic logic gates and logic circuits **(Apply – L3).**

CO3: Apply the minimization and realization methods for designing the Combinational & Sequential logic circuits **(Apply – L3).**

CO4: Analyze the Combinational, Sequential, and Finite State Machines for implementation of digital logic circuits **(Analyze – L4).**

UNIT – I: REVIEW OF NUMBER SYSTEMS & CODES:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed numbers. 2421 & 84-2-1 code. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-Morgan theorems. Logic operations; Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits.

UNIT – II: MINIMIZATION TECHNIQUES:

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine-McCluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Full Adder, half subtractor, full subtractor, applications of full adders; 4- bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a- head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III: COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI:

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder.

INTRODUCTION OF PLD's:

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV: SEQUENTIAL CIRCUITS-I:

Classification of sequential circuits (synchronous and asynchronous), operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip- flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register

Study the following relevant ICs and their relevant functions 7474, 7475, 7476, 7490, 7493, 74121.

UNIT – V: SEQUENTIAL CIRCUITS-II :

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping)

TEXT BOOKS:

1. Switching and finite automata theory Zvi. KOHAVI, Niraj. K. Jha 3rd Edition, Cambridge University Press, 2009
2. Digital Design by M. Morris Mano, Michael D Ciletti, 4th edition PHI publication, 2008
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCE BOOKS:

1. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006
2. Digital electronics by R S Sedha. S. Chand &companylimited,2010
3. Switching Theory and Logic Design by A. Anand Kumar, PHI Learningpvtltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning, 2006.
5. TTL 74-Series data book.

ONLINE LEARNING RESOURCES:

1. https://nptel.ac.in/courses/108105113

B. Tech. (III Sem.)

23EC52 – ELECTRONIC DEVICES AND CIRCUITS LAB

L	T	P	Cr.
0	0	3	1.5

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

COURSE OBJECTIVES:

- To know the characteristics and applications of Diode, BJT, FET, SCR, and UJT.
- To design the rectifiers, filters, and ampliers.
- To analyze the device parameters of Diodes, BJT, FET.

COURSE OUTCOMES:

At the end of this course student will be able to:

CO1: Demonstrate the characteristics of BJT, FET, SCR, UJT and applications of diode. (**Apply-L3**)

CO2: Model the Rectifiers, filters and Amplifiers used in electronic circuits**.** (**Apply-L3**)

CO3: Analyze the device parameters of Diodes, Bipolar Junction Transistors, and Field Effect Transistors for its electrical parameters using VI characteristics. (**Analyze – L4)**.

CO4: Adapt effective Communication, presentation and report writing skills. (**Apply-L3**)

LIST OF EXPERIMENTS: (Minimum of Ten Experiments has to be performed)

1. Measurement of Voltage, Current and Frequency of a circuit using CRO.
2. Design of Clipper circuit using diode
3. Design of Clamping circuit using diode
4. Estimation of ripple factor and regulation of rectifiers without and with LC filter.
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
5. Determination of h-parameter of a BJT in CE configuration
6. Determination of Break over voltage of SCR using V-I Characteristics
7. UJT Characteristics
8. Estimation of Stability factor for a transistor self-biasing circuit.
9. Frequency response of BJT-CE Amplifier
10. Design of Emitter Follower-CC Amplifier
11. FET Characteristics
    Part A: Drain Characteristics
    Part B: Transfer Characteristics
12. Design of FET-CS Amplifier

EQUIPMENT REQUIRED:

1. Regulated Power supplies
2. Analog/ Digital Storage Oscilloscopes
3. Analog/ Digital Function Generators
4. Digital Multi-meters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters(Analog or Digital)
8. Voltmeters(Analog or Digital)

9. Active& Passive Electronic Components.

ONLINE LEARNING RESOURCES:

1. https://nptel.ac.in/courses/108108112
2. https://nptel.ac.in/courses/108101091

B. Tech. (III Sem.)

23EC53 – SWITCHING THEORY AND LOGIC DESIGN LAB

L	T	P	Cr.
0	0	3	1.5

COURSE OBJECTIVES:

- To implement the logic gates by using Universal gates
- To implement the Combinational and Sequential circuits by using logic gates and logic circuits.
- To analyze the behavior of combinational and sequential circuits.

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Demonstrate the functionality of Logic gates, Flip-flops, Shift registers and Counters **(Understand – L2).**

CO2: Apply the Boolean minimization methods to implement Combinational and Sequential logic circuits using logic gates **(Apply – L3).**

CO3: Analyze the behavior of Combinational and Sequential logic circuits **(Analyze – L4)**

CO4: Adapt effective Communication, presentation and report writing skills **(Apply – L3).**

LIST OF EXPERIMENTS:

1. Implementation of the following Logic gates using Universal Gates:
   Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive-OR (vi) Exclusive-NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.
3. Verification of functional table of 3 to 8-line Decoder /De-multiplexer
4. 4 variable logic function verification using 8 to1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Verification of functional tables of (i) JK Master Slave Flip–Flop (ii) D Flip-Flop
7. Design a four-bit ring counter using D Flip–Flops/JK Flip Flop and verify output.
8. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip- Flops and Test It with a low frequency clock and sketch the output waveforms.
11. Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms.
12. (a) Draw the circuit diagram of a single bit comparator and test the output
    (b) Construct 7 Segment Display Circuit Using Decoder and7 Segment LED and test it.

ADDITIONAL EXPERIMENTS:

1. Design BCD Adder Circuit and Test the Same using Relevant IC
2. Design Excess-3 to 9- Complement convertor using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of 74154 De-Multiplexer using LEDs for outputs.

4. Design of any combinational circuit using Hardware Description Language
5. Design of any sequential circuit using Hardware Description Language

ONLINE LEARNING RESOURCES:

1. https://nptel.ac.in/courses/108105113

23CSS3 – DATA STRUCTURES USING C

B. Tech. (III Sem.)

L	T	P	Cr.
0	1	2	2

Prerequisites: Introduction to Programming

COURSE OBJECTIVES:

The main objectives of the course are to

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. To develop skills to apply appropriate data structures in problem solving.

COURSE OUTCOMES:

At the end of the course, Student will be able to

CO1: Implement various searching & sorting techniques. **(Apply-L3)**

CO2: Implement Linked List, Stack & Queue data structures. **(Apply-L3)**

CO3: Design and implement algorithms for operations on binary trees and binary search trees. **(Apply-L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values **(Apply-L3)**

UNIT-I: Introduction to Data Structures: Definition and importance of Data structures, Abstract data types (ADTs) and its specifications, Arrays: Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays, Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Quick sort.

Sample experiments:

1. Program to find min & max element in an array.
2. Program to implement matrix multiplication.
3. Find an element in given list of sorted elements in an array using Binary search.
4. Implement Selection and Quick sort techniques.

UNIT-II: Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

Sample experiments:

1. Write a program to implement the following operations.
2. a. Insert b. Deletion c. Traversal
3. Write a program to store name, roll no, and marks of students in a class using circular double linked list.
4. Write a program to perform addition of given two polynomial expressions using linked list.

UNIT-III: Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

Sample experiments:

1. Implement stack operations using
   a. Arrays b. Linked list

2. Convert given infix expression into post fix expression using stacks.
3. Evaluate given post fix expression using stack.
4. Write a program to reverse given linked list using stack.

UNIT-IV: Queues: Introduction to queues: properties and operations, Circular queues, implementing queues using arrays and linked lists, Applications of queues scheduling, etc.
Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

Sample experiments:

1. Implement Queue operations using a. Arrays b. Linked list
2. Implement Circular Queue using a. Arrays b. Linked list
3. Implement Dequeue using linked list.

UNIT-V: Trees: Introduction to Trees, Binary trees and traversals, Binary Search Tree – Insertion, Deletion & Traversal

Sample experiments:

1. Implement binary tree traversals using linked list.
2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.

TEXTBOOKS:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press, 2008

REFERENCE BOOKS:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders.
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft.
3. Problem Solving with Algorithms and Data Structures by Brad Miller and David Ranum.
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick.

23MC01 – ENVIRONMENTAL SCIENCE

B. Tech. (III Sem.)

L	T	P	Cr.
2	-	-	0

COURSE OBJECTIVES:

The objective of this course is to understand Environmental issues like natural resource depletion, pollution, interaction between human and ecosystems and their role in the food web in the natural world, importance of global biodiversity and significance of environmental law in India.

COURSE OUTCOMES:

In this course the student will learn about

CO1: The necessity of resources, their exploitation and sustainable management **(Understand – L2)**

CO2: The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation. **(Understand – L2)**

CO3: Environmental problems like pollution, disasters and possible solutions. **(Remember – L1)**

CO4: The importance of environmental decision making in organizations through understanding the environmental law and environmental audits. **(Remember – L1)**

CO5: Environmental issues like over population, human health etc related to local, regional and global levels. **(Understand – L2)**

UNIT – I:

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II:

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation : Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at

global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III:

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV:

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V:

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

TEXTBOOKS:

1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K. Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

REFERENCE BOOKS:

1. KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.
2. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
3. M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
4. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
5. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
6. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.
7. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

ONLINE LEARNING RESOURCES:

- https://onlinecourses.nptel.ac.in/noc23_hs155/preview
- https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-

B. Tech. (IV Sem.)

23HS02 – MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

- To inculcate the basic knowledge of Managerial economics and Financial Accounting
- To make the students learn how demand is estimated for different products, input output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

COURSE OUTCOMES:

CO1: Define the concepts related to Managerial Economics, Financial Accounting and Management(L2)

CO2: Understand the Fundamentals of Economics viz., Demand, Production, Cost, Revenue and Markets (L2)

CO3: Apply the Concept of Production cost and Revenues for effective Business Decision (L3)

CO4: Evaluate the Capital Budgeting Techniques. (L3)

CO5: Develop the Accounting Statements and Evaluate the Financial Performance of Business Entity (L4)

UNIT –I: Introduction to Managerial Economics: Economics-Managerial Economics-Nature and Scope. Demand-Law of demand-Elasticity of demand-Types of Elasticity of demand-Demand Forecasting -Methods.

UNIT –II: Theory of Production and Cost analysis: Production Function-Isoquant and Isocost, Least Cost Combination of inputs. Law of Returns, Internal and External Economies of Scale. Cost Concepts & Break-even Analysis.

UNIT –III: Markets & Pricing Policies: Market structures: Markets-Types of markets - Features and price out determinations under Perfect competition, Monopoly, Monopolistic Competition. Pricing –Pricing polices & its Objectives – Pricing Methods and its applications in business.

UNIT –IV: Capital and Capital Budgeting: Nature and its significance-Types of Capital - Sources of raising capital. Capital budgeting-Significance –Process- Techniques of Capital Budgeting (non-discounted cash flow techniques and discounted cash flow of techniques).

UNIT-V: Financial Accounting and analysis: Accounting –significance -- Book Keeping-Double entry system –Journal- Ledger- Trial Balance- Final Accounts with simple adjustments. Financial Statement Analysis through ratios.

TEXTBOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

REFERENCE BOOKS:

1. Ahuja H Managerial economics S Chand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

ONLINE LEARNING RESOURCES:

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

23EE09 – CONTROL SYSTEMS

B. Tech. (IV Sem.)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The objective of this course is to introduce the concepts of open loop and closed loop systems and to study the characteristics of the given system in terms of the transfer function and state variable approach. It also provides the concepts of the system response in time-domain and frequency domain in terms of various performance indices.

COURSE OUTCOMES:

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

CO1. Derive the transfer function of physical systems using block diagram algebra and signal flow graphs **(Apply-L3)**.

CO2. Obtain the time response of first order and specifications of second order systems **(Apply-L3)**.

CO3. Analyze the stability of LTI systems using Routh's stability criterion and root locus method. **(Apply-L3)**

CO4. Analyze the stability of LTI systems using frequency response methods and understand the classical control design techniques using Bode Diagrams. **(Apply-L3)**

CO5. Apply state space analysis concepts for deriving state models and also understand the concepts of controllability and observability **(Apply-L3)**

UNIT – I: Mathematical Modelling of Control Systems

Classification of control systems - open loop and closed loop control systems and their differences - Feedback characteristics - transfer function of linear system, differential equations of electrical networks- translational and rotational mechanical systems - transfer function of DC servo motor - block diagram algebra – representation by signal flow graph – reduction using Mason's gain formula.

UNIT – II: Time Response Analysis -I

Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - effects of proportional (P) - proportional integral (PI) - proportional derivative (PD) proportional integral derivative (PID) systems.

UNIT – III: Time Response Analysis - II

The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems) - Effect of addition of Poles and Zeros to the transfer function.

UNIT – IV: Frequency Response Analysis

Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram –Polar plots, Nyquist stability criterion- stability analysis using Bode plots (phase margin and gain margin).

Classical Control Design Techniques

Lag, lead, lag-lead compensators - physical realization - design of compensators using Bode plots.

UNIT – V: State Space Analysis of LTI Systems

Concepts of state - state variables and state model - state space representation of transfer function: Controllable Canonical Form - Observable Canonical Form - Diagonal Canonical Form - diagonalization using linear transformation - solving the time invariant state equations State Transition Matrix and its properties- concepts of controllability and observability.

TEXT BOOKS:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India, 2010.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

REFERENCE BOOKS:

1. Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th
2. Edition.
3. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition
4. Control Systems by Manik Dhanesh N, Cengage publications.
5. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
6. Control Systems Engineering by S.Palani, Tata Mc Graw Hill Publications.

ONLINE LEARNING RESOURCES:

1. https://archive.nptel.ac.in/courses/107/106/107106081/
2. https://archive.nptel.ac.in/courses/108/106/108106098/
3. https://nptelvideos.com/video.php?id=1423&c=14

B. Tech. (IV Sem.)

23EC05 – ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the fundamentals of electric fields, coulomb's law and gauss law
- To familiar with of Biot-Savart's Law, Ampere's Circuital Law and Maxwell equations
- To know the electromagnetic wave propagation in dielectric and conducting media
- To study the equivalent circuit of transmission lines and parameters of the transmission lines
- To learn the working of smith chart and its usage in the calculation of transmission line parameters

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Describe the concepts of electromagnetic field intensities using coulomb's law, Gauss law, Biot-Savart's Law and Ampere's Circuital Law. (**Understand – L2**)

CO2: Analyze the electromagnetic wave propagation in dielectric and conducting media. (**Apply – L3**)

CO3: Summarize the primary and secondary constants of different types of transmission lines. (**Understand – L2**)

CO4: Examine the parameters input impedance, reflection coefficient, and VSWR of transmission lines and calculate these parameters using smith chart. (**Apply – l3**)

UNIT – I: Review of Co-ordinate Systems, **Electrostatics:** Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

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

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

UNIT – III: EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems.

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, Illustrative Problems.

UNIT – IV: Transmission Lines - I : Types, Parameters, Equivalent Circuit, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase Velocity, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT – V: Transmission Lines – II: Input Impedance Relations, Reflection Coefficient, VSWR, Average Power, Shorted Lines, Open Circuited Lines, and Matched Lines, UHF Lines as Circuit Elements, Smith Chart – Construction and Applications, Quarter wave transformer, Introduction to Stub Matching, Illustrative Problems.

TEXTBOOKS:

1. Elements of Electromagnetic – Matthew N. O. Sadiku, Oxford University Press, 7th edition, 2018.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2008.

REFERENCE BOOKS:

1. Engineering Electromagnetics – William H. Hayt, John A. Buck, Jaleel M. Akhtar, TMH, 9th edition, 2020.
2. Electromagnetic Field Theory and Transmission Lines –G. S. N. Raju, Pearson Education 2006
3. Electromagnetic Field Theory and Transmission Lines: G Sasi Bhushana Rao,Wiley India 2013.
4. Networks, Lines and Fields John D. Ryder, Second Edition, Pearson Education, 2015.

ONLINE LEARNING RESOURCES:

1. https://www.youtube.com/playlist?list=PL0925FD10648D664E
2. https://nptel.ac.in/courses/108104099
3. https://nptel.ac.in/courses/108102119
4. https://nptel.ac.in/courses/108104087
5. https://archive.nptel.ac.in/courses/108/106/108106157/

B. Tech. (IV Sem.)

23EC06 – ELECTRONIC CIRCUIT ANALYSIS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn the concepts of single stage amplifiers, multistage amplifiers, feedback amplifiers, and oscillators.
- To study the effect of negative feedback on amplifiers.
- To analyze the characteristics of power amplifiers, tuned amplifiers
- To design the small signal high frequency amplifiers, multistage amplifiers, differential amplifiers.

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Illustrate the concepts of cascading of single stage amplifiers, feedback amplifier and oscillator circuits. **(Understand-L2)**

CO2: Analyze the effect of negative feedback on amplifier characteristics, Power amplifiers-Class A, B, C, AB and tuned amplifier circuits**. (Analyze-L4)**

CO3: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept. **(Apply-L3)**

CO4: Design and analysis of small signal high frequency transistor amplifiers, multistage amplifiers and Differential amplifier using BJT. **(Apply-L3)**

UNIT-I: Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitance, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II: Multistage Amplifiers: Classification of amplifiers, methods of coupling**, c**ascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis, Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT-III: Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT-IV: Oscillators: Oscillator principle, condition for oscillations, types of oscillators, analysis of RC- phase shift and Wien bridge oscillators using BJT, Generalized analysis of LC oscillators, Hartley and Colpitt's oscillators using BJT, Crystal oscillators, Frequency and amplitude stability of oscillators.

UNIT-V: Power Amplifiers: Classification of amplifiers(A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks.

Tuned Amplifiers: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, staggered tuned amplifiers.

TEXT BOOKS:

1. Integrated Electronics- J. Millman and C. C. Halkias, Tata McGraw-Hill, 2022.
2. Electronic Devices and Circuit Theory –Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition, 2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications, 2006.

REFERENCE BOOKS:

1. Electronic Circuits Analysis and Design –Donald A. Neaman, Mc Graw Hill, 2010.
2. Micro electronic Circuits - Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
3. Electronic Circuit Analysis-B. V. Rao, K. R. Rajeswari, P. C. R. Pantulu, K. B. R. Murthy, Pearson Publications.

ONLINE LEARNING RESOURCES:

1. https://archive.nptel.ac.in/courses/108/102/108102097/
2. https://nptel.ac.in/courses/108101091
3. https://nptel.ac.in/courses/108102095

23EC07 – ANALOG COMMUNICATIONS

B. Tech. (IV Sem.)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To provides the Knowledge on various analog modulation techniques in both time and frequency domains.
- To understand the generation and demodulation methods of various analog modulation techniques.
- To give the information regarding functions of AM and FM transmitters and receivers.
- To understand the effect of noise on the performance of AM and FM receivers and the principles of PAM, PWM, and PPM, TDM and FDM techniques.

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Describe the Modulation and Demodulation techniques of Amplitude Modulation. (**Understand L2**)

CO2: Interpret the generation and detection of Angle Modulation techniques. (**Understand L2**).

CO3: Summarize the concepts of Radio Transmitters and Receivers. (**Understand L2**)

CO4: Illustrate the noise performance in Analog Modulation techniques and also the concepts of Pulse Analog Modulation and Demodulation techniques (**Understand L2**)

UNIT – I: Amplitude Modulation: Introduction to communication system, need for modulation, Amplitude Modulation, Time domain and Frequency domain descriptions, Single tone modulation, Power relations in AM waves, Generation of AM waves: Square law Modulator, Switching modulator, Detection of AM Waves: Square law detector, Envelope detector, Related problems.

UNIT – II: DSB & SSB Modulation: Double sideband suppressed carrier modulator: Time domain and frequency domain description, Generation of DSBSC Waves: Balanced Modulator, Ring Modulator, Detection of DSBSC Waves: Coherent detection, Quadrature Null Effect, Costas Loop.

Single sideband suppressed carrier modulator: Time domain and Frequency domain description, Generation of SSBSC Waves: Frequency discrimination method, Phase discrimination method, Demodulation of SSB Waves: Coherent Detection.

Vestigial sideband modulation: Time domain description, Frequency domain description, Generation of VSB Modulated wave, Envelope detection of a VSB Wave pulse Carrier, Comparison of different AM Techniques, Applications of different AM Systems, Frequency Division Multiplexing, Related problems.

UNIT – III: Angle Modulation: Introduction, Basic concept of phase modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave, Generation of FM Waves: Direct Method, Indirect Method, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM, Related problems.

UNIT – IV: Radio Transmitters: Classification of Transmitters, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter: Variable reactance type FM Transmitter, Frequency stability in FM Transmitter.

Radio Receivers: Receiver Types: Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics, Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Amplitude limiting.

UNIT – V: Noise: Noise in Analog communication Systems: Noise in DSB & SSB Systems, Noise in AM System and Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & De-emphasis.

Pulse Analog Modulation: Types of Pulse modulation, PAM (Single polarity, double polarity), PWM: Generation & Detection of PWM, PPM: Generation and Detection of PPM, Time Division Multiplexing.

TEXT BOOKS:

1. Communication Systems, Simon Haykin, Michael Moher, Wiley, 5th Edition, 2009.
2. Principles of Communication Systems, H Taub, D L Schilling, Gautam Sahe, TMH, 4th Edition, 2017.
3. Modern Digital and Analog Communication Systems, B.P.Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press, 4th Edition, 2017.

REFERENCE BOOKS:

1. Electronics & Communication Systems, George Kennedy, Bernard Davis, S R M Prasanna, TMH, 6th Edition, 2017.
2. Communication Systems, R P Singh, S D Sapre, TMH, 3nd Edition, 2017.
3. Communication Systems (Analog and Digital), Dr. Sanjay Sharma, Katson Books, 7th Reprint Edition, 2018

ONLINE LEARNING RESOURCES:

1. http://nptel.ac.in/courses/117102059/ Prof. Surendra Prasad.
2. https://nptel.ac.in/courses/117105143
3. https://ict.iitk.ac.in/wp-content/uploads/EE320A-Principles-Of-Communication-CommunicationSystems-4ed-Haykin.pdf.
4. https://www.scribd.com/document/266137872/sanjay-sharma-pdf.
5. http://bayanbox.ir/view/91440908351988908 6/Book-Modern-Digital-And-AnalogCommunication- Systems-4th-edition-by-Lathi.pdf.
6. https://soaneemrana.org/onewebmedia/ELECTRONICS%20COMMUNICATION%20SYSTEM%20 BY%20GEORGE%20KENNEDY.pdf

23EC54 – SIGNALS AND SYSTEMS LAB

B. Tech. (IV Sem.)

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To understand the basics of MATLAB Programming
- To get hands on experience on handling numerous signals and datasets
- To visualize real time signals

COURSE OUTCOMES:

At the end of this course the student will able to:

CO1: Understand the basics of MATLAB Programming. (**Understand – L2**)

CO2: Perform basic operations on Signals (**Apply – L3**)

CO3: Obtain the spectral representation of given signal (**Apply – L3**)

CO4: Adapt effective Communication, presentation and report writing skills. (**Apply – L3**)

LIST OF EXPERIMENTS (To be simulated Using MATLAB):

1. Generation of Basic Signals (Analog and Discrete)
2. Operations on signals
3. Estimation of Energy and power of signals
4. Obtain the response of a system using Convolution
5. Perform Correlation between Signals
6. Estimation of Fourier series Coefficients of given periodic signal
7. Analysis of Fourier Spectrum using Fourier Transform
8. Estimation of Laplace transform of an arbitrary function
9. Estimation of Z-transform of an arbitrary sequence
10. Estimation of power spectral density for noisy signals

ONLINE LEARNING RESOURCES:

1. https://www.iitg.ac.in/cseweb/vlab/Signal-System-Lab/signalsystem /Signals%20and%20their%20properties(simulator).html

B. Tech. (IV Sem.)

23EC55 – ELECTRONIC CIRCUIT ANALYSIS LAB

L	T	P	C
0	0	3	1.5

Note: The students are required to design the circuit and perform the simulation using Multisim/Equivalent Industrial Standard Licensed simulation software tool**.** Further they are required to verify the result using necessary hardware equipment.

COURSE OBJECTIVES:

- To demonstrate the characteristics of amplifiers, oscillators, and their applications.
- To analyze the effect of resistance and capacitance on frequency response and gain of amplifiers and oscillators.
- To design the feedback amplifiers, power amplifiers, tuned amplifiers, and oscillator circuits.

COURSE OUTCOMES:

At the end of this course student will be able to:

CO1: Demonstrate the characteristics of amplifiers, oscillators and its applications. (**Understand – L2**)

CO2: Apply the knowledge of Resistance and capacitance effects on frequency response and gain of amplifiers and oscillator circuits. (**Apply – L3**)

CO3: Design different types of feedback amplifiers, Power amplifier, Tuned amplifiers, Oscillators with different characteristics. (**Apply – L3**)

CO4: Adapt effective Communication, presentation and report writing skills. (**Apply – L3**)

LIST OF EXPERIMENTS: (Minimum of Ten Experiments has to be performed)

1. Determination of Voltage gain of an amplifier using its frequency response.
2. Analysis of Stabilization of Gain of Transistorized Voltage series Feedback amplifier.
3. Analysis of stabilization of Gain of Transistorized Current-Shunt Feedback Amplifier.
4. Design and Realization of Transistorized RC Phase shift Oscillator/ Wien Bridge Oscillator to generate a sinusoidal signal.
5. Design and Realization of Transistorized Hartley/Colpitt's Oscillator to generate a sinusoidal signal.
6. Determination of Gain and Bandwidth of two stage RC Coupled amplifier from the frequency response.
7. Determination of Gain and Bandwidth of Darlington Pair Amplifier from the frequency response.
8. Determination of Gain and Bandwidth of Boots trapped Emitter Follower from the frequency response.
9. Design of Class A Series-fed Power Amplifier.
10. Design of Transformer-coupled Class A Power Amplifier.
11. Design of Class B Push-Pull Power Amplifier.
12. Design of Complementary Symmetry Class B Push-Pull Power Amplifier.
13. Determination of Gain and Bandwidth of Single Tuned Voltage Amplifier.
14. Determination of Gain and Bandwidth of Double Tuned Voltage Amplifier

EQUIPMENT REQUIRED:

SOFTWARE:

1. Multisim/Equivalent Industrial Standard Licensed simulation software tool.
2. Computer Systems with required specifications

HARDWARE:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

ONLINE LEARNING RESOURCES:

1. https://nptel.ac.in/courses/108108112
2. https://nptel.ac.in/courses/108101091

23CSS1 – PYTHON PROGRAMMING

B. Tech. (IV Sem.)

L	T	P	C
0	1	2	2

Prerequisites: Introduction to Programming

COURSE OBJECTIVES:

The main objectives of the course are to

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these.

COURSE OUTCOMES:

After learning the contents of this course, the student must be able to

CO1: Implement the core programming concepts of Python programming language. **(Apply-L3)**

CO2: Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries. **(Apply-L3)**

CO3: Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications. **(Apply-L3)**

CO4: Improve individual / teamwork skills, communication & report writing skills with ethical values. **(Apply-L3)**

UNIT-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators
   iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II:

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
   i.Addition ii. Insertion iii. slicing
6. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

UNIT-IV:

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.

4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V:

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
7. Apply head () function to the pandas data frame
8. Perform various data selection operations on Data Frame
9. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

REFERENCE BOOKS:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2ndEdition, Pearson, 2024
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

ONLINE LEARNING RESOURCES/VIRTUAL LABS:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

B. Tech. (IV Sem.)

23ME57 – DESIGN THINKING AND INNOVATION

L	T	P	C
1	0	2	2

COURSE OBJECTIVE:

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: Apply fundamental design components, principles, and new materials to create and improve design projects. **(Applying-L3)**

CO2: Apply the design thinking process to develop and present innovative product solutions. **(Applying-L3)**

CO3: Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions. **(Analyzing-L4)**

CO4: Analyze to work in a multidisciplinary environment. **(Analyzing – L4)**

CO5: Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity. **(Evaluating-L5)**

UNIT – I: Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II: Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III: Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV: Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.
Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V: Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.
Activity: How to market our own product, about maintenance, Reliability and plan for startup.

TEXTBOOKS:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCE BOOKS:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

ONLINE LEARNING RESOURCES:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

B. Tech. (V Sem.)

23EC08 – Analog & Digital IC Applications

L	T	P	Cr.
3	0	0	3

Course Outcomes:

CO1: Apply the operational principles and characteristics of op-amps to design and analyze analog circuits such as amplifiers and active filters. (**Apply-L3**)

CO2: Design waveform generators and comparator circuits using op-amps for signal processing applications. (**Analyse-L4**)

CO3: Implement and troubleshoot combinational and sequential logic circuits using digital ICs. (**Analyse-L4**)

CO4: Compare different data conversion techniques (DAC and ADC) and implement digital-to-analog and analog-to-digital conversion circuits in real-time applications. (**Apply-L3**)

CO5: Develop sequential circuits using flip-flops, counters, and shift registers, and analyse their use in digital memory systems, including ROM, RAM, and their variants. (**Analyse-L4**)

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 Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer-Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL-Block Schematic, 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, De-multiplexers, 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.

TEXTB OOKS:

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

B. Tech. (V Sem.)

23EC09 – Digital Communications

L	T	P	Cr.
3	0	0	3

Pre-Requisites: Analog Communications

Course Educational Objective: This course provides the knowledge on different digital modulation techniques. The course provides different concepts on information theory, block codes and convolution codes. It also gives the complete information regarding the design of optimum receivers for digital communication systems and their performance analysis.

Course Outcomes (COs): At the end of the course, student will be able to

CO1	**Understand** the principles and components of digital communication systems, sampling, quantization, and modulation techniques.
CO2	**Analyze** and compare baseband and passband digital modulation techniques, including PCM, DM, PSK, FSK, and QPSK, in terms of signal representation and system design.
CO3	**Evaluate** the performance of digital modulation schemes, using signal-to-noise ratio (SNR), bit error rate (BER), and probability of error, under noisy channel conditions.
CO4	**Apply** error control coding methods to enhance data transmission efficiency and reliability.

UNIT – I

Introduction to Digital Communication: Analog and Digital signals, Need for Digital Communication, Line Codes- Unipolar, Polar and Bipolar, Elements of a Digital Communication System, Sampling, quantization, Types of quantization, Quantization noise and error, Need for non-uniform quantization, Companding: μ-law, A-law, Source encoder- decoder, Channel Encoder-decoder, Application of TDM in Telephony, Problems related to TDM, Bit Rate, Baud Rate, System Bandwidth, Channel Bandwidth, Characteristics of channel and types of channels,

UNIT – II

Pulse Digital Modulation- Block diagram of Pulse Code Modulation, Regenerative repeaters, Bandwidth for PCM, Quantization noise and output Signal to noise ratio in PCM. Delta Modulation-Transmitter, Receiver, Bandwidth for DM, Effect of noise in DM - slope overload distortion, Granular noise, Adaptive Delta Modulation- Transmitter, Receiver Block diagram, Comparison of PCM , DM and ADM.

UNIT – III

Digital Modulation Techniques: Digital modulation types, Coherent Binary Modulation Techniques: BASK, BPSK, BFSK, QPSK, M-ary Modulation techniques, Bandwidth efficiency for M-ary PSK, Bandwidth efficiency for M-ary FSK, Non Coherent Digital modulation techniques: ASK, FSK and DPSK, QAM.

UNIT – IV

Optimal Reception of Digital Signal: Model of digital communication system- signal detection in noise, Receiver Techniques: Correlation receiver and matched filter receiver, Probability of error for Coherent BASK, BPSK, BFSK, Probability of error for non-coherent FSK and DPSK, Bit Error Rate Vs Signal to Noise Ratio for M-ary FSK and M-ary PSK.

UNIT – V

Linear Block Codes : Linear Block codes- matrix description of Linear Block codes, Syndrome Decoding, Hamming codes- encoding and decoding; Binary Cyclic Codes- Algebraic structure, Systematic and Non Systematic form, Encoding, Syndrome calculation;

Convolution Codes: Encoding of Convolution Codes- Time domain approach, Transform domain approach and Graphical approach- State diagram, Code tree and Trellis diagram; Decoding of Convolution Codes- Viterbi decoding algorithm.

TEXT BOOKS

1. Simon Haykin, *"Digital Communications",* John Wiley & sons, 2nd Edition.
2. Taub and Schilling, *"Principles of Communication Systems"*, TMH Publications, 3rd edition.

REFERENCE BOOKS

1. J. S. Chitode,*"Digital Communications",* Technical Publications, first edition.
2. V. ChandraSekar**,** *"Communication Systems",* Oxford University Press**.**
3. Theodore S. Rappaport, *Wireless Communications: Principles and Practice*, 2nd Edition, Pearson Education India, 2010.

B. Tech. (V Sem.)

23EC10 – Antennas and Wave Propagation

L	T	P	Cr.
3	0	0	3

Pre-requisites: EM Fields and Waves, Transmission Lines, and wave guides

Course Educational Objective: This course provides the knowledge on Antennas and Radiation fundamentals. The course will expose different types of Antennas and their applications. The course also gives the complete information regarding Propagation of Radio wave in atmosphere.

Course Outcomes (COs): At the end of the course, students will be able to

CO1	**Understand** fundamental antenna parameters and basic radiation mechanisms and characteristics of radio wave propagations
CO2	**Understand** the operation and characteristics of thin linear wire , loop antennas, HF, VHF and UHF Antennas
CO3	**Apply** principles of antenna array design to compute and interpret radiation patterns and directivity
CO4	**Analyze** wave propagation modes and antenna measurement setups using theoretical models and equations.

UNIT-I:

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – Single Wire, 2-Wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Field Regions, Main Lobe and Side Lobes, Beam width, Radiation Intensity, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization, Input Impedance, Beam Area and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT-II:

THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half Wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Radiation Efficiency, Beam width, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and R_r relations for small loops

UNIT-III:

ANTENNA ARRAYS: 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations), Related Problems. Binomial Arrays, Effects of Uniform and Non-Uniform Amplitude Distributions, Design Relations Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics

UNIT-IV

BROADBAND ANTENNAS: Log periodic antenna, Basic principle, Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UHF AND MICROWAVE ANTENNAS:

Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns;

Paraboloidal Reflectors: – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Case grain Feeds.
Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics, illustrated Problems.

UNIT-V
ANTENNA MEASUREMENTS: FRIIS Transmission Equation, Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

WAVE PROPAGATION: Types of propagations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance; Space Wave Propagation – Mechanism, LOS and Radio Horizon, Field strength equation, illustrated Problems.

TEXT BOOKS:

1. Constantine A. Balanis "Antenna Theory: Analysis and Design", 3rd Edition, A John Wiley & Sons, Inc., Publication.
2. John D. Kraus and Ronald J. Marhefka "Antennas for All Applications", 3rd Edition, TMH, 2003.
3. E.C. Jordan and K.G. Balmain "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000.

REFERENCES:

1. G.S.N. Raju, "Antennas and Wave Propagation", Pearson Publications, 2006.
2. E.V.D. Glazier and H.R.L. Lamont "Transmission and Propagation", The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
3. John D. Kraus "Antennas", McGraw-Hill, 2nd Edition, 1988.

23EC11 – Computer Organization and Architecture

B. Tech. (V Sem.)

L	T	P	Cr.
3	0	0	3

Course Outcomes:

CO1: Understand the representation of data, the register transfer language and Micro operations.
CO2: Know the basic computer organization and design, programming the basic computer and design the micro programmer control unit.
CO3: Apply various algorithms for computer arithmetic operations.
CO4: Demonstrate various Peripheral devices and various data transfer operations and memory types & hierarchy.

UNIT-I:

Introduction: Digital Computers, Von Neumann computers, Basic organization of a computer,
Data Representation: Data types, Complements, Fixed-point representation, Conversion of fractions, Floating-point representation.
Register Transfer and Micro operations: Register transfer language, Register transfer, Bus and Memory transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit

UNIT-II:

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic computer
Programming the Basic Computer: Introduction, Machine Language, Assembly language, The Assembler, Program Loops, Programming Arithmetic and Logic Operations
Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit (**Preferably from Reference Book 2**)

UNIT-III:

Central Processing Unit: Introduction, General Register Organization, Stack organization, Instruction Formats, Addressing Modes, Data transfer and Manipulation, Program Control, Reduced Instruction Set Computer
Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT-IV:

Input-Output organization : Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

UNIT-V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Text Book

1. M. Morris Mano," Computer System Architecture," Pearson Publishers, Revised Third Edition

Reference Books

1. John P Hayes, "Computer Architecture and Organization," Mc-Graw Hill Publishers, Third Edition
2. Carl Hamacher, "Computer Organization," Tata Mc-Graw Hill Publishers, Fifth Edition.

23EC12 – Digital System Design through HDL

B. Tech. (V Sem.)

L	T	P	Cr.
3	0	0	3

Course Outcomes:

CO1: Understand the language constructs and programming fundamentals of Verilog HDL.
CO2: Construct Combinational and sequential circuits in different modelling styles using Verilog HDL
CO3: Design and synthesize combinational and sequential logic circuits
CO4: Analyze and verify the functionality of digital circuits/systems using test benches.

UNIT-I:

Introduction to Verilog HDL and Gate Level Modelling: Verilog as HDL, Levels of Design Description Basics of Concepts of Verilog, Data Types, System Task, Compiler directives, modules and ports. AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flip-flops with Gate Primitives, Delay.

UNIT-II:

Behavioural Modelling: Introduction, structured processors, procedural assignments, timing controls, conditional statements, multi-way branching, loops, sequential and parallel blocks, generate blocks, Design of Decoders, Multiplexers, Flip-flops, Registers & Counters in Behavioral model.

UNIT-III:

Modelling at Data flow Level: Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Design of Decoders, Multiplexers, Flip-flops, Registers & Counters in dataflow model, Switch Level Modelling: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitive delays.

UNIT-IV:

FSM Design: Functions, Tasks, User-defined, Primitives: Introduction, Function, Tasks, User-Defined Primitives (UDP), FSM Design (Moore and Mealy Machines), Encoding Style: From Binary to One Hot. Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines

UNIT-V:

Components Test and Verification: Test Bench – Combinational Circuits Testing, Sequential Circuits Testing, Test Bench Techniques, Design Verification, Assertion Verification

Text Books:

1. Samir Palnitkar, "Verilog HDL A Guide to Digital and Synthesis", 2nd Edition, Pearson Education, 2006.
2. Michael, D. Ciletti, "Advanced digital design with the Verilog HDL", Pearson Education India, 2005.

Reference Books:

1. Padmanabhan, Tripura Sundari -Design through Verilog HDL, Wiley, 2016
2. S. Brown, Zvonko – Vranesic, Fundamentals of Digital Logic with Verilog Design, TMH, 3rd Edision 2014.
3. J. Bhasker, "A Verilog HDL Primer" 2nd edition, BS Publications, 2001.

B. Tech. (V Sem.)

23EC13 – Electronic Measurements and Instrumentation

L	T	P	Cr.
3	0	0	3

Course Outcomes:

- **CO1:** Understand the various Analog and Digital measuring Instruments. (**Understand-L2**)
- **CO2:** Aware of the principles and operations of various oscilloscopes. (**Understand-L2**)
- **CO3:** Learn measurements using various bridges. (**Understand-L2**)
- **CO4:** Familiarize different Signal Generators and function generators. (**Understand-L2**)
- **CO5:** Learn various transducers and Intelligent sensors. (**Understand-L2**)

UNIT I

Measuring Instruments: Introduction, Errors in Measurement, Accuracy, Precision, Resolution and Significant figures, Basic PMMC Meter- construction and working, DC and AC Voltmeters-Multirange, Range extension, DC Ammeter, Multimeter for Voltage, Current and resistance measurements.

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multimeters, Digital frequency meters, Digital measurement of time.

UNIT II

Oscilloscopes: Introduction, Block diagram of CRO, Basic principle of CRT, CRT Construction and features, vertical amplifiers, horizontal deflection system- sweep, trigger pulse, delay line, sync selector circuits. Dual beam and dual trace CROs, Sampling and Digital storage oscilloscopes.

UNIT III

Bridges: DC Bridges for Measurement of resistance - Wheat stone bridge, Kelvin's Bridge, AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge, Measurement of capacitance - Schearing Bridge, Wien Bridge, Errors and precautions in using bridges.

UNIT IV

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.

UNIT V

Transducers: Introduction, Types of Transducers, Electrical transducers, Selecting a transducer, Resistive transducer, Strain gauges, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Temperature transducers-RTD, LVDT.

Intelligent Sensors: definition of intelligent instrumentation, types of instruments, Classification, Smart sensors, Cogent Sensors, Soft or Virtual sensors, Self-Adaptive Sensors, Self-Validating Sensors, Temperature Compensating Intelligent Sensors, Pressure Sensor, Indirect Sensing. (**Text Book 3**)

TEXT BOOKS

1. H. S. Kalsi, "Electronic Instrumentation", Third edition, Tata McGraw Hill, 2010.
2. D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 6th Edition, 2010.
3. Manabendra Bhuyan, ―Intelligent Instrumentation: Principles and Applications CRC Press, 2011.

REFERENCE BOOKS

1. A.K. Sawhney, Dhanpat Rai & Co., "A course in Electrical and Electronic Measurements and Instrumentation", 9th Edition, 2010.
2. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2006.

B. Tech. (V Sem.)

23EC14 – Optical Communications

L	T	P	Cr.
3	0	0	3

Pre-requisites: Electromagnetic Theory, **and** analog communications

Course Educational Objective: This course gives knowledge on optical communication fundamentals, fiber types, and fiber materials. This course also describe about transmission losses in the fiber, optical sources, source to fiber coupling scheme, and optical receivers. This course also provides understanding of digital optical link, analog optical systems, wavelength division multiplexing.

Course Outcomes (COs): At the end of the course, students will be able to

CO1	Identify and choose suitable optical components, cables, connectors, and splicing methods for communication systems. *(L2)*
CO2	Understand the behavior of light through optical fibers and analyze losses, dispersion, and fiber materials. (L2)
CO3	Apply concepts of optical sources (LEDs, ILDs) and detectors (PIN, APD) in optical communication systems. (L3)
CO4	Apply optical system design principles to analyze power launching, digital/analog receiver performance, link budgeting, dispersion, and WDM. (L3)

UNIT I

Overview of optical fiber communication - Historical development, the general system, advantages of optical fiber communications. Optical fiber waveguides-Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers-Cutoff wave length, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT II

Fiber materials: Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Related problems.

UNIT III

Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing-Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss-Multimode fiber joints, single mode fiber joints.

UNIT IV

Optical sources-LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power band width product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, and Laser diode rate equations, resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Comparison of Photo detectors, Related problems.

UNIT V

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation-Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers. Optical system design - Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXTBOOKS:

1. Gerd Keiser, "Optical Fiber Communications", Mc Graw- Hill International edition, 3rd Edition, 2000.
2. Joseph C.Palais, "Fiber Optic Communications" Pearson Education, 4thEdition, 2004.

RERFERENCES:

1. D. K. Mynbaev, S. C. Gupta and Lowell L. Scheiner, "Fiber Optic Communications", Pearson Education, 2 005.
2. S. C. Gupta, "Text Book on Optical Fiber Communication and its Applications" PHI, 2005.
3. Govind P. Agarwal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.

B. Tech. (V Sem.)

23EC56 – Analog & Digital IC Applications Lab

L	T	P	Cr.
0	0	3	1.5

CO1: Demonstrate the characteristics and applications of Op-Amp, Timer, VCO and PLL. (**Understand – L2**)
CO2: Design Active filters, arithmetic circuits, waveform generators and data converters using Op-Amp (**Apply – L3**)
CO3: Analyze combinational and sequential circuits using Static CMOS logic from schematic to layout. (**Analyze – L4**)
CO4: Adapt effective Communication, presentation and report writing skills. **(Apply- L3)**

PART-A: (Minimum **SIX** Experiments to be conducted):

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
5. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
6. Function Generator using OP AMPs.
7. IC 555 Timer – Astable & Mono-stable Operation Circuit.
8. Schmitt Trigger Circuits – using IC 741 and IC 555.
9. IC 565 – PLL Applications.
10. IC 566 – VCO Applications.
11. 4 bit DAC using OP AMP.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 etc.
8. Analog IC Tester

PART-B: (Minimum **SIX** Experiments to be conducted):

The students are required to design and draw the internal structure of the following Digital Integrated Circuits and to develop HDL (VHDL, Verilog HDL) source code, perform simulation using relevant simulator and analyze the obtained simulation results using appropriate synthesizer. Further, it is required to verify the logic with necessary hardware.

List of Experiments:

1. Realization of Logic Gates
2. 3 to 8 Decoder- 74138
3. 8*1 Multiplexer-74151 and 2*1 De-multiplexer-74155
4. 4-Bit Comparator-7485.
5. D Flip-Flop- 7474
6. Decade Counter- 7490
7. Universal shift register-74194/195
8. RAM (16*4)-74189 (read and write operations)

Equipment Required:

1. Xilinix Vivado/Equivalent Standard IDE
2. Personal computer with necessary peripherals
3. Hardware kits- Various FPGA families.

23EC57 – Analog & Digital Communications Lab

B. Tech. (V Sem.)

L	T	P	Cr.
0	0	3	1.5

Pre-Requisites: Analog Communications, Signals and Systems

Course Educational Objective: This Course provides practical exposure on different aspects of analog and digital communications. It demonstrates the importance of different modulation techniques in analog and digital communication systems.

Course Outcomes (COs): At the end of the course, student will be able to

CO1	**Demonstrate** basic analog communication techniques such as amplitude and frequency modulation/demodulation, and understand their characteristics. **(Understand – L2).**
CO2	**Apply** sampling theorem and implement pulse modulation techniques including PAM, PWM, and PPM using suitable hardware and simulation tools. **(Apply – L3).**
CO3	**Design** and Implement digital communication methods like PCM, DM, FSK, PSK, and DPSK using suitable hardware or simulation tools. **(Apply – L3).**
CO4	**Design** and test basic multiplexing and channel coding techniques including TDM, linear block codes, and cyclic codes. **(Analyze – L4).**
CO5	**Adopt** effective communication, presentation and report writing skills **(Apply – L3).**

List of Experiments:

(Fourteen experiments to be done-The students have to calculate the relevant parameters)

Part-A

1. Amplitude Modulation-Modulation & Demodulation
2. AM-DSBSC-Modulation & Demodulation
3. Pre-emphasis & De-emphasis
4. Frequency Modulation-Modulation & Demodulation
5. Verification of Sampling Theorem
6. Pulse Amplitude Modulation & Demodulation
7. PWM,PPM–Modulation & Demodulation

Part-B

1. Time division multiplexing.
2. Pulse code modulation.
3. Delta modulation.
4. Frequency shift keying.
5. Phase shift keying.
6. Differential phase shift keying.
7. Linear Block Code-Encoder and Decoder and Binary Cyclic Code–Encoder and Decoder

Note: All the above experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

Equipment & Software required:

Software:

i) Computer Systems with latest specifications
ii) Connected in LAN (Optional)
iii) Operating system (Windows/Linux software)
iv) Simulations software (Simulink &MATLAB)

Equipment:

1. RPS : 0 –30V
2. CRO : 0–20MHz.
3. Function Generators : 0–1MHz
4. Components and Breadboards

23EC58 – Design and Simulation of Antennas Lab

B. Tech. (V Sem.)

L	T	P	Cr.
0	0	2	1

Pre-requisites: Electromagnetic waves and Transmission Lines.

Course Educational Objectives: To equip students with practical knowledge and simulation skills in antenna design, electromagnetic wave analysis, impedance matching, and development of modern antennas for wireless applications.

Course Outcomes (COs): At the end of the course, students will be able to

CO1	Analyze EM wave characteristics and perform impedance matching using Smith Chart for efficient antenna performance **(Analyze – L4)**
CO2	Design and simulate various antennas including dipole, monopole, and microstrip types **(Apply – L3)**
CO3	Interpret radiation patterns and assess antenna suitability for wireless applications like Bluetooth, Wi-Fi, and WiMAX **(Apply – L3)**
CO4	Adapt effective Communication, presentation and report writing skills **(Apply – L3)**

List of experiments: (Any Ten experiments using any simulation software)

1. Generation of EM-Wave
2. Impedance Matching using Smith Chart
3. Calculation of phase and group velocity
4. Plot of Radiation pattern of dipole antenna
5. Plot of Radiation pattern of monopole antenna
6. Design of Microstrip Patch Antenna with Strip Line Feed
7. Design of Microstrip Patch Antenna with Coaxial Feed
8. Design and Analysis of Rectangular Microstrip Patch Antenna
9. Design of Patch Antenna for Bluetooth Applications
10. Design of Patch Antenna for Wi-Fi Applications
11. Design of Patch Antenna for WiMAX Applications
12. Design and Simulation of Circular Microstrip Patch Antenna
13. Design and Simulation of Hexagonal Microstrip Patch Antenna
14. Design of Dual Band Patch Antennas
15. Design of Wideband Patch Antennas
16. Design of Patch Antennas with Defected Ground Structures (DGS)

B. Tech. (V Sem.)

23ECS2 – Idea Implementation Lab

L	T	P	Cr.
0	1	2	2

PREREQUISITE: STLD, Python Programming.

COURSE EDUCATIONAL OBJECTIVE (CEO):
In this course, student will learn about basics of IoT and procedure to develop prototypes for engineering applications.

COURSE OUTCOMES (COs): At the end of this course, students will be able to
CO1: Understand the programming concepts of IOT. (**Understand – L2)**
CO2: Develop real time applications using Internet of Things. (**Apply – L3**
CO3: Demonstrate the integration of sensors with IOT. (**Understand – L2)**
CO4: Adapt effective Communication, presentation and report writing skills **(Apply – L3)**

UNIT – I:
IoT Basics: IoT, Frame work, Architectural View, Technology, Sources, M2M communication, Sensors, Participatory sensing, RFID, Wireless sensor network elements

UNIT – II:
IoT Applications: Prototyping embedded devices for M2M and IoT, M2M and IoT case studies.

TEXTBOOKS:
1. Raj Kamal, Internet of Things - Architecture and Design Principles, McGraw Hill Publication, 2017.
2. Zach Shelby, Carsten Bormann: "The Wireless Embedded Internet", Wiley, 1st Edition.

REFERENCES:
1. Arshdeep Bahga and Vijay Madisetti, Internet of Things – A Hands-on Approach, University Press, 2015
2. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford Press.

HANDS – ON LABORATORY SESSIONS

1. Interfacing LED. DHT11- Temperature and, humidity sensor using Arduino
2. Interfacing Ultrasonic sensor and PIR sensor using Arduino
3. Design of Traffic Light Simulator using Arduino
4. Design of Water flow detection using an Arduino board
5. Interfacing of LED, Push button with Raspberry Pi and Python Program
6. Design of Motion Sensor Alarm using PIR Sensor
7. Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi
8. Interfacing DS18B20 Temperature Sensor with Raspberry Pi
9. Implementation of DC Motor and Stepper Motor Control with Raspberry Pi
10. Raspberry Pi based Smart Phone Controlled Home Automation
11. Smart Traffic light Controller
12. Smart Health Monitoring System

B. Tech. (VI Sem.)

23EC15 – VLSI Design

L	T	P	Cr.
3	0	0	3

Pre-requisites: EDC and STLD

Course Outcomes:
CO1: Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
CO2: Design basic building blocks in Analog IC design.
CO3: Design various CMOS logic circuits for design of Combinational logic circuits.
CO4: Analyze the behavior of static and dynamic logic circuits.

UNIT-I:
INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

UNIT-II:
BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.
SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density.

UNIT-III:
BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

UNIT-IV:
CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:
Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic, design of Half adder, full adder, multiplexer, decoder. **Dynamic CMOS Design:** Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Design examples of sequential circuits: Cross coupled NAND and NOR flip-flops, D flip-flop, SR JK flip flop, SR Master Slave flip flop.

UNIT-V:
FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.
INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, FinFET, TFET.

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell
2. And Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
3. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 2003
4. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2nd edition, 2016.

REFERENCES:

1. "Introduction to VLSI Circuits and Systems", John P. Uyemura, John Wiley & Sons, reprint 2009.
2. Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.
3. FinFETs and other multi-gate transistors, Colinge JP, Editor New York, Springer, 2008.

23EC16 – Microprocessors & Microcontrollers

B. Tech. (VI Sem.)

L	T	P	Cr.
3	0	0	3

Pre-Requisites: Switching Theory and Logic Design

Course Educational Objective: The objective is the course to provide fundamentals about architecture and functioning of microprocessors, microcontrollers, and ARM processors. It enables to analyze operating modes and interrupt systems, apply assembly language for programming, interfacing and design real-time solutions using various modules with advanced processors. The objective is to prepare students for embedded system design, automation, and IoT-based applications.

Course Outcomes:

CO1: Understand the architecture of Microprocessor, Micro controllers and advanced processors, viz., ARM processors its operation.
CO2: Applying assembler instructions of processors & controllers to interface with necessary peripherals
CO3: Analyze the various operating modes and interrupt structures of processors and controllers
CO4: Create interfacing with various modules with microprocessors and microcontrollers.

Unit -I

Introduction: History and classifications of Microprocessor and Microcontroller, Microprocessor Unit versus Microcontroller Unit,
8086 Architecture: register organization, internal architecture of 8086, pin description of 8086, minimum mode and maximum mode of 8086 operation and timing diagrams.

Unit -II

8086 Programming: instruction set, addressing modes, assembler directives, programming with an assembler, writing simple programs with an assembler, interrupts and interrupt service routine, interrupt vector table, types of interrupts of 8086 system,

Unit -III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Intel 8251 USART architecture and interfacing, Intel 8257 / 8237 DMA controller, stepper motor interfacing, A/D and D/A converters, Need for 8259 programmable interrupt controllers, ICWs and OCWs.

Unit -IV

Intel 8051 MICROCONTROLLER and Interfacing: Architecture, Input/output ports, internal /external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs.
Interfacing to 8051: Semiconductor memories interfacing with 8051 (RAM, ROM), A/D and D/A Convertors, Stepper motor interface, LCD Interfacing, Traffic light control.

Unit –V

ARM Architectures and Processors: Introduction to CISC and RISC architectures, ARM Architecture, ARM design philosophy, ARM Processors Families, Registers, Program status register, Instruction pipeline, Interrupts and Interrupt vector table of ARM, Addressing modes,
ARM Programming: Instruction set - Data processing instructions, Branch, Load-Store instructions, multiple register Load and Store instructions, PSR instructions and Conditional instructions. programs on arithmetic, logical and bitwise operations, programs using branch instructions, Writing loops with counters

TEXTBOOKS:

1. Advanced microprocessors and peripherals by K. M. Bhurchandi, A. K. Ray 3e
2. The 8051 Microcontrollers and Embedded Systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition,2011.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph Yiu, Newnes Third edition.

REFERENCEBOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media, 2017.
2. Cortex-M3 Technical Reference Manual.

B. Tech. (VI Sem.)

23EC17 – Digital Signal Processing

L	T	P	Cr.
3	0	0	3

Pre-requisites : Signals & Systems

Course Educational Objective:
This course introduces discrete time signals and systems and operations performed on them. It introduces Discrete time Fourier Transform; Discrete Fourier transform meant for spectral analysis of discrete time signals and systems. It also introduces Fast Fourier Transform which is an efficient way of implementing DFT. The course also provides the basic knowledge about the design of both IIR and FIR filters. It also provides a overview about the architectures of Digital signal Processors.

Course Outcomes: At the end of the course, the student will be able to:
CO1: Understand the concepts of discrete time signals and systems in time domain (L2-Understand).
CO2: Examine the frequency domain representation of discrete time signals (L3-Apply)
CO3: Design and realization of IIR Filters and FIR Filters (L3-Apply)
CO4: Inerpret the aarchitectures of digital signal processors

UNIT – I
Discrete Time Signals: Discrete Time Signals, Classification of Discrete Time Systems: Linear and Nonlinear, Shift Invariant and Variant, Causal and Non Causal, Stable and Unstable, static and dynamic, IIR and FIR systems, Analysis of Discrete Time Linear Time Invariant Systems: Discrete Time Systems Described by Difference Equations, Implementation of Discrete Time Systems, Convolution and Correlation of Discrete Time Signals.
Discrete Time Fourier Transform: DTFT of a Sequence, Frequency Response; Properties of DTFT- Linear, Periodicity, Time Shifting, Frequency Shifting, Time Reversal, Conjugate and Parseval's Theorem (Proofs not expected).

UNIT – II
Discrete Fourier Transform: DFT of a sequence, Relation between DTFT and DFT, Properties of Twiddle factor, Properties of DFT- Linearity, Periodicity, Time Shifting, Frequency Shifting, Time Reversal, differentiation in frequency domain, Conjugate, Parseval's Theorem, Circular Convolution; Linear Convolution through DFT and IDFT.
Fast Fourier Transform: Need for FFT, Radix-2 Decimation in Time FFT Algorithm, Radix-2 Decimation in Frequency FFT Algorithm, Comparison between DIT and DIF Algorithms, Inverse FFT.

UNIT – III
Realization of Discrete Time Systems:
Structures for FIR and IIR Systems: Direct Form Structure, Cascade Form Structures, Parallel Form Structures.
IIR Filters: Design of IIR digital filters - Impulse Invariant Transformation, Bilinear Transformation. Design of Low Pass Butterworth Filter and Chebyshev Filter, Analog Frequency Transformations.

UNIT – IV
FIR Filters: Symmetric and Antisymmetric FIR Filters, Design of Linear Phase FIR Filters Using Windows: Rectangular Window, Triangular, Hanning Window, Hamming Window and Kaiser Window, Comparison of various Window Functions, Design of Linear Phase FIR Filters by the Frequency Sampling Method, Comparison between FIR and IIR Filters.

UNIT – V

Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multi ported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Auxiliary Register Compare Register, Block Move Address Register, Block Repeat Registers, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers.

TEXT BOOKS

1. John G. Proakis, Dimitris G. Manolakis *"Digital Signal Processing, Principles, Algorithms & Applications"*, Pearson education, 4th edition, 2008
2. Deep Learning for Computer Architects, Brandon Reagen, Robert Adolf, Gu-Yeon Wei, David Brooks

REFERENCES

1. Alan V Openheim, Ronald W. Schafer, *"Digital Signal Processing"*, PHI learning, 1st edition, 2010.
2. A. Nagoor Kani, *"Digital Signal Processing"*, RBA Publications, 1st edition, 2005.
3. P. Ramesh Babu, *"Digital Signal Processing"*, Scitech Publications, 4th edition, 2012 Pvt Ltd.

A. Anand kumar, *"Digital Signal Processing"*, PHI Learning, 2nd edition, 2016.

B. Tech. (VI Sem.)

23EC18 – Analog IC Design

L	T	P	Cr.
3	0	0	3

Pre-requisite: EDC and STLD

Course Outcomes:
CO1: Understand the concepts of MOS Devices and Modeling.
CO2: Design and analyze any Analog Circuits in real time applications.
CO3: Extend the Analog Circuit Design to Different Applications in Real Time.
CO4: Understand the Open-Loop Comparators and Different Types of Oscillators.

UNIT -I:
MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modelling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT -II:
Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference**.**

UNIT -III:
CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures. CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -IV:
Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete- Time Comparators.

UNIT -V:
Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators. Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

TEXT BOOKS:
1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, Second Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition,2010.

REFERENCES:
1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition,2010.
2. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.

B. Tech. (VI Sem.)

23EC19 – Satellite Communication

L	T	P	Cr.
3	0	0	3

Pre-Requisites: Analog Communications & Digital Communications.

Course Educational Objective: This course provides the technical knowledge of orbital dynamics, launching of satellite in to the orbit, various subsystems used in space segment, uplink and downlink aspects of satellite. This course will also give an idea about different multiple access techniques, design requirements for the selection of earth station and various real time applications.

Course Outcomes (COs): At the end of the course, students will be able to

CO1	Understand the basic principles, orbital mechanics, launch vehicles, and subsystems involved in satellite communication systems.
CO2	Apply satellite link design principles including link budget equations, C/N and G/T ratios, to evaluate overall system performance.
CO3	Summarize the concepts of multiple access techniques (FDMA, TDMA, CDMA) and analyze the components and architecture of earth stations.
CO4	Describe the structure, operation, and applications of GNSS systems including GPS and IRNSS, and analyze their role in satellite-based navigation

UNIT I

INTRODUCTION: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT II

SATELLITE SUBSYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring system, power systems, communication subsystems, Satellite antennas, Equipment reliability and Space qualification.

UNIT III

SATELLITE LINK DESIGN: Basic transmission theory, link equation, C/N ratio, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT IV

MULTIPLE ACCESS: Frequency division multiple access (FDMA): Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA); Frame structure, Examples. Code Division Multiple access (CDMA): Spread spectrum transmission and reception.

EARTH STATION TECHNOLOGY: Introduction, basic architecture, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

UNIT V

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS):

Introduction, various GNSS: GPS, GLONASS, GALILEO, BeiDou, QZSS, IRNSS. GPS-location principle, GPS navigation message, GPS receiver operation, differential GPS; IRNSS-introduction, IRNSS satellites, IRNSS constellation, IRNSS configuration, IRNSS services, navigation data, applications of IRNSS; multi GNSS.

TEXT BOOKS:

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, "Satellite Communications", WSE, Wiley Publications, 3RD Edition, 2020.
2. Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, "Satellite Communications Engineering", Pearson Publications, 2nd Edition, 2003.

REFERENCES:

1. M. Richharia, "Satellite Communications: Design Principles", BS Publications, 2nd Edition, 2003.
2. D.C Agarwal, "Satellite Communication", Khanna Publications, 5th Ed.
3. K.N. Raja Rao, "Fundamentals of Satellite Communications" PHI, 2004
4. Dennis Roddy, "Satellite Communications", McGraw Hill, 2nd Edition, 1996.

23EC20 – Smart and Wireless Instrumentation

B. Tech. (VI Sem.)

L	T	P	Cr.
3	0	0	3

COURSE OUTCOMES: At the end of the course, student will be able to
CO1: Analyze Smart and Wireless Instrumentation with respect to various performance parameters
CO2: Design and develop Applications using WSN (Wireless sensor Network).
CO3: Demonstrate o various Node architectures and fundamentals of wireless digital communications.
CO4: Analyze the power sources, Demonstrate an ability to design strategies as per needs and specifications

UNIT – I:
Introduction: Smart Instrumentation(Materials, automation systems, ensign and Sensors, Sensor Classifications, Wireless Sensor Networks, History of Wireless Sensor networks (WSN), Communication in a WSN, important design constraints of a WSN like Energy, Self-Management, Wireless Networking, Decentralized Management, Design Constraints, Security etc.

UNIT – II:
Node architecture: The sensing subsystem, Analog to Digital converter, the processor subsystem, architectural overview, microcontroller, digital signal processor, application specific integrated circuit, field programmable gate array (FPGA), comparison, communication interfaces, serial peripheral interface, inter integrated circuit, the IMote node architecture, The XYZ node architecture, the Hog throb node architecture.

UNIT – III:
Fundamentals of Wireless Digital Communication: Basic components, source encoding, the efficiency of a source encoder, pulse code modulation and delta modulation, channel encoding, types of channels, information transmission over a channel, error recognition and correction, modulation, modulation types, quadratic amplitude modulation, signal propagation.

UNIT – IV:
Frequency of Wireless Communication: Development of Wireless Sensor Network based on Microcontroller and communication device-Zigbee Communication device. Power sources-Energy Harvesting Solar and Lead acid batteries-RF Energy /Harvesting-Energy Harvesting from vibration Thermal Energy Harvesting-Energy Management Techniques Calculation for Battery Selection.

UNIT – V:
Applications: Structural health monitoring - sensing seismic events, single damage detection using natural frequencies, multiple damage detection using natural frequencies, multiple damage detection using mode shapes, coherence, piezoelectric effect, traffic control, health care - available sensors, pipeline monitoring, precision agriculture, active volcano, underground mining.

TEXT BOOKS:

1. Fundamentals of wireless sensor networks: theory and practice - Waltenegus Dargie, Christian Poellabauer, A John Wiley and Sons, Ltd., Publication.
2. Smart Sensors, Measurement and Instrumentation, Subhas Chandra Mukhopadhyay, Springer Heidelberg, New York, Dordrecht London, 2013.
3. Wireless Sensors and Instruments: Networks, Design and Applications, HalitEren, CRC Press, Taylor and Francis Group, 2006.

REFERENCE BOOKS:

1. Uvais Qidwai, Smart Instrumentation: A data flow approach to Interfacing“, Chapman & Hall; 1st Edn, December 2013.
2. Wireless Sensor Networks: Architectures and Protocols, Edgar H. Callaway Jr. and Ed gar H. Callaway.

B. Tech. (VI Sem.)

23EC21 – Data Communications and Networks

L	T	P	Cr.
3	0	0	3

Pre-Requisites
Basic knowledge on Digital numbering system; Micro Controller Peripheral Programming, Communication interfaces and protocols

OBJECTIVE
To make student to acquire knowledge about transferring data using various Wired/Wireless communication technologies.

COURSE OBJECTIVES (COs):
CO1: Understand the basic concepts of communication systems, including signal types, transmission modes, and network topologies.
CO2: Explain the OSI model, types of communication media, and the basics of error detection and flow control in networks.
CO3: Apply knowledge of wired and wireless communication protocols to identify their advantages, disadvantages, and applications.
CO4: Apply routing techniques, network types, and basic security mechanisms such as firewalls and NAT in communication networks.

Unit-I
Introduction to Communication and Networking: Communications, Signal Types and its characteristics (Analog/Digital), Data Transmission Types (Serial/Parallel), Communication Techniques (Asynchronous, Synchronous), Data Transmission Modes (Simplex, Half/Full Duplex), Network Topologies (Star, Ring, Mesh, Point to Point, Tree, Bus, Daisy chain, Multi drop) and its applications, Bandwidth utilization: multiplexing and spreading.
OSI Layers: Communication Layers and its applications, Communication media (Twisted Pair, Coaxial, Fiber Optics), Introduction to Errors (Error types, Detection, Correction) and Flow Control and its applications.

Unit-II
Data Link Layer: Design issues, Error detection and correction codes, Elementary data link protocols, Sliding window protocols.
Network Layer: Design issues, routing algorithms-Optimality principle, shortest path algorithm, Flooding, Distance vector routing, Link state routing, Hierarchical routing, Congestion control algorithms.

Unit-III
Wired Communication Protocols and standards: Ethernet (Types, Socket, MAC, IP, ARP, ICMP, TCP, UDP, and DHCP), CAN, Modbus (RTU, ASCII), UART (RS485, RS232), OFC and Advantages, Disadvantages and its applications, Introduction to Dial up Modems, Leased line modems.

Unit-IV
Wireless Communication Protocols and Standards: Zigbee, Bluetooth, Wi-Fi, GPRS, GSM, NFC, IR, LoRa, NB-IoT, Satellite Communication. Advantages, Disadvantages and its applications.
IoT Protocols: SP06, MQTT, COAP, STOMP, AMQP

Unit-V

Network Types: Introduction to LAN, WAN, PAN, Internet and Intranet, sensor networks (wired/wireless) and its applications, Introduction to NAT, PAT, DNS, Network Routing algorithms, Introduction to Switch, Hub, Bridges and its working, Network Security and Introduction to Firewall and its applications.

TEXTBOOKS:

1. Introduction to data communication and networking by Behrouz Forouzan
2. Basics of data communications by William Stallings
3. Designing and Deploying 802.11n Wireless Networks by Jim Geier

REFERENCE BOOKS:

1. Introduction to data communication and networking by Wayne Tomasi
2. Basics of computer networking by Thomas Robertazzi
3. Wireless Networking Absolute Beginner's Guide by Michael Miller
4. "The Internet of Things: Foundations and Applications" by Qusay H. Mahmoud
5. "The Future of IoT: Leveraging the Shift to a Data Centric World" by Don DeLoach, W. David Stephenson, Emil Berthelsen

23EC22 – Bio Medical Instrumentation

B. Tech. (VI Sem.)

L	T	P	Cr.
3	0	0	3

COURSE OUTCOMES:

CO1: Demonstrate a foundational understanding of the anatomy and physiology of the human body.

CO2: Apply knowledge of different techniques used for measuring various physiological parameters

CO3: Understand modern imaging techniques employed in medical diagnosis and identify the diverse therapeutic equipment utilized in the biomedical field.

CO4: Analyze patient safety measures and evaluate recent advancements in the medical field

UNIT – I:

Introduction: Factors to be considered in the design of medical instrumentation systems, Basic objectives of medical instrumentation system, Physiological systems of human body, Sources of Bioelectric potentials: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, Introduction to bio-medical signals.

UNIT – II:

The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmo graphy, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT – III:

Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT – IV:

Bio telemetry and Instrumentation for the Clinical Laboratory, Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT – V:

X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic Resonance Imaging System, Ultrasonic Imaging System, Medical Thermography.

TEXT BOOKS:

1. Biomedical Instrumentation and Measurements C. Cromwell, F. J. Weibell, E. A. Pfeiffer – Pearson education.
2. Biomedical Signal Analysis – Rangaraj, M. Rangayya – Wiley Inter Science – JohnWilley & Sons Inc.

REFERENCE BOOKS:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, TMH.
2. Introduction to Bio-Medical Engineering – Domach, Pearson.
3. Introduction to Bio-Medical Equipment Technology – Cart, Pearson.

23EC23 – Microwave Engineering

B. Tech. (VI Sem.)

L	T	P	Cr.
3	0	0	3

PRE-REQUISITES: Vector calculus, Coordinate Systems, Basics of electromagnetics.

COURSE OBJECTIVE: This course provides the knowledge on different types of waveguides and resonators. The course will give an idea about microwave communication in terms of various bands, advantages, applications. The course also gives the complete information regarding the microwave tubes and passive devices along with microwave bench setup and microwave measurements.

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

CO1	**Analyze** the propagation characteristics, mode structure, and power handling capabilities of rectangular waveguides and microstrip lines.
CO2	**Compare** the structure, operation, and efficiency of microwave tubes and solid-state devices including Klystrons, TWTs, Magnetrons, and TEDs.
CO3	**Evaluate** the function and interconnection of microwave components such as tees, couplers, and isolators for efficient system design.
CO4	**Summarize** key microwave parameters such as power, frequency, attenuation, VSWR, and impedance using microwave test benches.

UNIT-I

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. **Rectangular Waveguides** – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Related Problems.**MICROSTRIP LINES**– Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor

UNIT II

MICROWAVE TUBES: Limitations and Losses of conventional tubes at microwave frequencies. Microwave tubes – O type and M type classifications. **O-type tubes:** 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for o/p Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, Electronic and Mechanical Tuning.Applications.

UNIT-III

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Nature of the four Propagation Constants, Gain Considerations(qualitative treatment).**M-type Tubes** Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT-IV

WAVEGUIDE COMPONENTS AND APPLICATIONS: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types, Scattering Matrix– Significance, Formulation and

Properties, S-Matrix Calculations for – 2,3,4 port Junctions: E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types,S-Matrix Calculations Ferrite Components– Faraday Rotation, Gyrator, Isolator, Circulator, Related Problems.

UNIT-V

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q- factor, Phase shift, VSWR, Impedance Measurement .

TEXT BOOKS:

1. R.E. Collin, "Foundations for Microwave Engineering," IEEE Press, John Wiley, 2nd Edition, 2002.
2. Annapurna Das and SisirK.Das, "Microwave Engineering", McGraw Hill Education, 3rd Edition. 2001.

REFERENCES:

1. Samuel Y. Liao, "Microwave Devices and Circuits" PHI, 3rd Edition,1994.
2. G S N Raju, "Microwave Engineering", IK International Publishing House Pvt. Limited, 2013.
3. M.Kulkarni, "Microwave and Radar Engineering", Umesh Publications, 3rd Edition,1998.

B. Tech. (VI Sem.)

23EC24 – Embedded Systems

L	T	P	Cr.
3	0	0	3

Course Outcomes:

CO1: Understand the basics of embedded system, classification, memories, different communication interfaces and embedded firmware and its role in embedded system.
CO2: Demonstrate all communication devices in embedded system, and peripheral devices.
CO3: Distinguish concepts of C versus embedded C and compiler versus cross-compiler.
CO4: Choose an operating system, and learn how to choose an RTOS

UNIT-I:

Introduction: Embedded System-Definition, History, Classification, application areas and purpose of embedded systems, the typical embedded system-Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and passive components. Characteristics, Quality attributes of an embedded systems, Application-specific and Domain-Specific examples of an embedded system, and Main processing elements of embedded system, hardware and software partitions.

UNIT-II:

Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watch dog timer, Real time clock.

UNIT-III:

Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV:

Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Threads, Processes and Scheduling, Task Scheduling, Communication, Synchronization, Device Drivers, How to choose an RTOS. Electronics and Communication Engineering

Hardware Software Co-Design: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hard ware and Firm ware, ICE.

UNIT-V:

Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Dissembler/De-compiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Embedded System Implementation And Testing: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host-machine, Simulators, Laboratory Tools. Test and evolution of an embedded systems (Build in self-test etc.).

Case study-typical embedded system design flow with an example.

Text Books:

1. Embedded Systems Architecture By Tammy Noergaard, Elsevier Publications,2005
2. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications.

References:

1. Embedding system building blocks By Labrosse, CMP publishers.

B. Tech. (VI Sem.)

23EC25 – Sensors and Actuators

L	T	P	Cr.
3	0	0	3

Prerequisites: Basic Electrical and Electronics, Physics

COURSE OBJECTIVES:
Understand the physical principles behind various sensors and actuators. Learn the interfacing techniques and signal conditioning methods. Analyze and evaluate sensor-actuator systems in real-world applications. Design basic sensing and actuation systems for specific applications.

COURSE OUTCOMES: At the end of the course, student will be able to
CO1: Identify and classify various types of sensors and actuators based on their working principles and applications.
CO2: Explain the characteristics, specifications, and performance of sensors and actuators.
CO3: Apply signal conditioning and data acquisition techniques for sensor interfacing.
CO4: Design and simulate sensor-actuator systems using appropriate hardware and software tools.
CO5: Analyze practical case studies involving sensors and actuators in industrial, biomedical, and consumer applications.

UNIT-I:
Introduction to Sensors and Actuators: Definitions and classifications; General characteristics of sensors and actuators; Static and dynamic characteristics.

UNIT-II:
Sensors: Resistive, capacitive, inductive sensors; Optical sensors: photodiodes, phototransistors, LDRs; Temperature sensors: RTDs, thermocouples, thermistors; Magnetic sensors: Hall Effect sensors, magnetoresistive sensors; Motion and position sensors: Encoders, LVDT, Potentiometers; Pressure and force sensors; Chemical and biosensors.

UNIT-III:
Actuators: Electromechanical actuators: DC/AC motors, stepper motors, servo motors; Piezoelectric actuators; Hydraulic and pneumatic actuators; Thermal actuators

UNIT-IV:
Interfacing and Signal Conditioning: Amplifiers, filters, A/D and D/A converters; Signal processing techniques; Microcontroller-based interfacing; Communication protocols (I2C, SPI, UART)

UNIT-V:
Applications and Case Studies: Sensors and actuators in automotive systems; Industrial automation and control; Smart homes and IoT systems; Robotics and biomedical instrumentation

TEXTBOOKS:
1. Sensors and Actuators: Engineering System Instrumentation – Clarence W. de Silva
2. Introduction to Mechatronics and Measurement Systems – David G. Alciatore and Michael B. Histand
3. Measurement Systems: Application and Design – Ernest O. Doebelin

REFERENCE BOOKS:
1. Handbook of Modern Sensors – Jacob Fraden
2. Transducers and Instrumentation – D.V.S. Murty
3. Mechatronics – W. Bolton

B. Tech. (VI Sem.)

23EC59 – VLSI Design Lab

L	T	P	Cr.
3	0	0	3

Laboratory Objective

The objective of this laboratory course is to enable students to design, simulate, and implement CMOS-based digital and analog circuits using industry-standard Electronic Design Automation (EDA) tools. Students are expected to develop a comprehensive understanding of schematic capture, layout design, and verification methodologies as per current CMOS technology standards.

COURSE OUTCOMES: At the end of the course, student is able to

CO1: Implement combinational and sequential circuits in Verilog. (Apply – L3)

CO2: Design the Combinational and Sequential logic using NMOS and CMOS Technology. (Apply – L3)

CO3: Analyze combinational and sequential circuits using Static CMOS logic from schematic to layout. (Analyze – L4)

CO4: Adapt effective communication, presentation and report writing skills. (Apply – L3)

List of Experiments:

Students shall design the schematic diagrams using CMOS logic, generate corresponding layout diagrams, and perform simulation and analysis using the latest CMOS process technology with the aid of **professional-grade EDA tools (Cadence/Synopsys/Mentor Graphics/Tanner/Microwind or any Industry Standard EDA Tools)**.

The following experiments shall be carried out:

1. Design and implementation of an inverter
2. Design and implementation of universal gates
3. Design and implementation of full adder
4. Design and implementation of full Subtractor
5. Design and implementation of RS-latch
6. Design and implementation of D-latch
7. Design and implementation asynchronous counter
8. Design and Implementation of static RAM cell
9. Design and Implementation of differential amplifier
10. Design and Implementation of ring oscillator

Equipment Required:

1. Cadence/Synopsys/Mentor Graphics/Tanner/Microwind or any Industry Standard EDA Tools
2. Personal computer with necessary peripherals.

23EC60 – Microprocessors & Microcontrollers Lab

B. Tech. (VI Sem.)

L	T	P	Cr.
3	0	0	3

Pre requisite: Digital Logic Design Lab

Course Educational Objective:
The lab to provide hands-on experience with microprocessors, microcontrollers, and ARM-based systems. It aims to understand instruction sets, programming techniques, and hardware interfacing. This equip students with practical skills in peripheral interfacing, sensor integration, and embedded system development through real-time applications, preparing them for careers in embedded systems and automation.

Course Outcomes: (COs): At the end of the course, students are able to:

CO1 : Demonstrate the MASM/TASM tool for developing Assembly Language Programs.

CO2 : Apply the Assembly Language instructions of Processor and Controller for logical operations.

CO3 : Develop the ARM based interfacing systems for Real time applications.

CO4 : Adapt effective communication, presentation and report writing skills.

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed) 8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
   a. Addition and subtraction of n-BCD numbers.
   b. Multiplication and Division operations.
   c. Addition of an array of numbers with overflow detection.
2. Program for sorting an array.
3. Program for Factorial of given n-numbers.
4. Interfacing DAC to8086.
5. Interfacing stepper motor to8086.
6. Interfacing Seven-Segment display to 8086

PART-B: (Minimum of 5 Experiments has to be performed) 8051 Assembly Language Programming and Interfacing

1. Arithmetic operations like Addition, Subtraction, Addition of series, Multiplication and Division.
2. 2.Finding number of 1's and number of 0's in a given 8-bit number
3. Average of n-numbers.
4. Checking the for number of Odd and Even from the given list
5. Interfacing Traffic Light Controller to8051.
6. Interfacing temperature sensor (LM 35) with 8051

PART-C (Minimum of 2 Experiments has to be performed) Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integer numbers.
3. Write a program to toggle LED every second using timer interrupt
4. Write a program to toggle 8-bit LED Pattern (Running Light) – Create patterns like left shift, right shift, alternating bits, etc.

5. Write a program to generate PWM signal generation
6. Write a program to Interface LCD to ARM

Equipment Required:

1. 8086 Microprocessor kits
2. 8051 microcontroller kits
3. ADC module, DAC module
4. Stepper motor module
5. Key board module
6. LED, 7-SegemtUnits, LCD display modules
7. Temperature sensor module
8. ARM CORTEX M3
9. KEIL MDKARM, Digital Multi-meters