ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI (AUTONOMOUS)

AK23-REGULATIONS

B.TECH – ELECTRONICS AND COMMUNICATION ENGINEERING

INDUCTIONPROGRAM(3weeksduration)
❖ Physical activity ❖ Creative Arts ❖ Universal Human Values ❖ Literary ❖ Proficiency Modules ❖ Lectures by Eminent People ❖ Visits to local Areas ❖ Familiarization to Dept./ Branch and Innovations

B.Tech. –I Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T/CLC	P	C			
1	BS	23ABS9903	Engineering Physics	4	2	0	3	30	70	100
2	BS	23ABS9904	Linear Algebra and Calculus	4	2	0	3	30	70	100
3	ES	23AES0201	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100
4	ES	23AES0301	Engineering Graphics	1	0	4	3	30	70	100
5	ES	23AES0501	Introduction to Programming	4	2	0	3	30	70	100
6	ES	23AES0503	IT Workshop	0	0	2	1	30	70	100
7	BS	23ABS9908	Engineering Physics Lab	0	0	2	1	30	70	100
8	ES	23AES0202	Electrical & Electronics Engineering Workshop	0	0	3	1.5	30	70	100
9	ES	23AES0502	Computer Programming Lab	0	0	3	1.5	30	70	100
10	HM	23AHM9904	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5	50	-	50
Total				16	06	15	20.5	320	630	950

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B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.– I Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	CI E	SEE	Total
				L	T/CLC	P	C			
1	HM	23AHM9901	Communicative English	2	2	0	2	30	70	100
2	BS	23ABS9901	Chemistry	4	2	0	3	30	70	100
3	BS	23ABS9905	Differential Equations and Vector Calculus	4	2	0	3	30	70	100
4	ES	23AES0101	Basics of Civil & Mechanical Engineering	3	0	0	3	30	70	100
5	PC	23APC0203	Network Analysis	3	0	0	3	30	70	100
6	HM	23AHM9902	Communicative English Lab	0	0	2	1	30	70	100
7	BS	23ABS9906	Chemistry Lab	0	0	2	1	30	70	100
8	ES	23AES0302	Engineering Workshop	0	0	3	1.5	30	70	100
9	PC	23APC0204	Network Analysis and Simulation Laboratory	0	0	3	1.5	30	70	100
10	HM	23AHM9903	Health and Wellness, Yoga and Sports	0	0	1	0.5	50	-	50
Total				16	6	11	19.5	320	630	950

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B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.–II Year I Semester

S. No.	Category	Course code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T/CLC	P	C			
1	BS	23ABS9912	Probability and Complex Variables	4	2	0	3	30	70	100
2	HM	23AHM9905	Universal Human Values	4	2	0	3	30	70	100
3	ES	23AES0401	Signals, Systems and Stochastic Processes	3	2	0	3	30	70	100
4	PC	23APC0401	Electronic Devices and Circuits	3	1	0	3	30	70	100
5	PC	23APC0402	Digital Circuit Design	3	1	0	3	30	70	100
6	PC	23APC0403	Electronic Devices and Circuits Lab	0	0	3	1.5	30	70	100
7	PC	23APC0404	Digital Circuits and Signal Simulation Lab	0	0	3	1.5	30	70	100
8	SC	23ASC0501	Python Programming	0	1	2	2	30	70	100
Total				17	9	8	20	240	560	800

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B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech.– II Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T/CLC	P	C			
1	HM	23AHMMB01	Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
2	ES	23AES0203	Linear Control Systems	3	0	0	3	30	70	100
3	PC	23APC0405	EM Waves and Transmission Lines	3	1	0	3	30	70	100
4	PC	23APC0406	Electronic Circuits Analysis	3	1	0	3	30	70	100
5	PC	23APC0407	Analog and Digital Communications	3	1	0	3	30	70	100
6	PC	23APC0408	Electronic Circuits Analysis Lab	0	0	3	1.5	30	70	100
7	PC	23APC0409	Analog and Digital Communications Lab	0	0	3	1.5	30	70	100
8	SC	23ASC9901	Soft Skills Lab	0	1	2	2	30	70	100
9	ES	23AES0304	Design Thinking & Innovation	1	0	2	2	30	70	100
10	Audit Course	23AMC9901	Environmental Science	2	0	0	0	30	-	30
			Total	17	4	10	21	300	630	930
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation										

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B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.– III Year I Semester

S. No.	Category	Course code	Title	L	T	P	Credits
1	PC		Analog and Digital IC Applications	3	0	0	3
2	PC		Antennas and Wave Propagation	3	0	0	3
3	PC		Microprocessors and Microcontrollers	3	0	0	3
4	PE -I		Computer Architecture & Organization	3	0	0	3
			Information Theory and Coding				
			Detection and Estimation Theory				
			Artificial Intelligence				
5	OE-I			3	0	0	3
6	PC		Analog & Digital IC Applications Lab	0	0	3	1.5
7	PC		Microprocessors and Microcontrollers Lab	0	0	3	1.5
8	SC		PCB Design and Prototype Development	0	1	2	2
9	ES		Tinkering Lab	0	0	2	1
10	Evaluation of Summer Internship			-	-	-	2
Total				15	1	10	23

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B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech.– III Year II Semester

S. No.	Category	Course code	Title	L	T	P	Credits
1	PC		Digital Signal Processing	3	0	0	3
2	PC		Microwave and Optical Communications	3	0	0	3
3	PC		VLSI Design	3	0	0	3
4	PE–II		Electronic Measurements and Instrumentation	3	0	0	3
			Data Communications and Networking				
			Machine Learning				
			Introduction to Robotics				
5	PE -III		Embedded Systems	3	0	0	3
			Satellite Communications				
			Optimization Techniques				
			Cyber Security				
6	OE-II			3	0	0	3
7	PC		Microwave and Optical Communications Lab	0	0	3	1.5
8	PC		VLSI Design Lab	0	0	3	1.5
9	SC		AI and Signal Processing	0	1	2	2
10	Audit Course		Technical Paper Writing & IPR	2	0	0	-
Total				20	1	08	23
Mandatory Industry Internship of 08 weeks duration during summer vacation							

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B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.– IV Year I Semester

S. No.	Category	Course code	Title	L	T	P	Credits
1	PC		Cellular & Mobile Communication	3	0	0	3
2	HM		Entrepreneurship and Incubation/ Management Science / Human Resource Management	2	0	0	2
3	PE-IV		Low Power VLSI Design	3	0	0	3
			Radar Engineering				
			Digital Image Processing				
			5G Communications				
4	PE-V		Sensors and Actuators	3	0	0	3
			Wireless Sensor Networks				
			Speech Processing				
			Internet of Things				
5	OE- III			3	0	0	3
6	OE- IV			3	0	0	3
7	SC		Industrial IoT & Automation	0	1	2	2
8	Audit Course		Gender Sensitization	2	0	0	-
9	Internship		Evaluation of Industry Internship	-	-	-	2
Total				19	1	02	21

B.Tech– IV Year II Semester

S. No.	Category	Course code	Title	L	T	P	Credits
1	PR	23APR0401	Internship and Project	-	-	24	**12**

B.Tech. –I Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T/CLC	P	C			
1	BS	23ABS9903	Engineering Physics	4	2	0	3	30	70	100
2	BS	23ABS9904	Linear Algebra and Calculus	4	2	0	3	30	70	100
3	ES	23AES0201	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100
4	ES	23AES0301	Engineering Graphics	1	0	4	3	30	70	100
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6	ES	23AES0503	IT Workshop	0	0	2	1	30	70	100
7	BS	23ABS9908	Engineering Physics Lab	0	0	2	1	30	70	100
8	ES	23AES0202	Electrical & Electronics Engineering Workshop	0	0	3	1.5	30	70	100
9	ES	23AES0502	Computer Programming Lab	0	0	3	1.5	30	70	100
10	HM	23AHM9904	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5	50	-	50
Total				16	06	15	20.5	320	630	950

Annamacharya Institute of Technology & Sciences (Autonomous), Tirupati

AK23 Regulations

Course Code	ENGINEERING PHYSICS	L	T /CLC	P	C
23ABS9903		**4**	**2**	**0**	**3**
Regulation: **AK23**	Common to I B.Tech ECE, AI&DS, AI&ML, ME, CE (Sem-1) & CSE, CIC, EEE, &CSD (Sem-2)				

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

1. **Understand the intensity variation of light due to interference, diffraction, and polarization.**
2. **Analyze the fundamentals of crystallography and X-ray diffraction.**
3. **Apply the basic concepts of dielectric and magnetic materials for engineering applications.**
4. **Analyze the fundamentals of Quantum mechanics and interpret the nano materials for engineering problems.**
5. **Analyze the charge carrier dynamics in semiconductors by implementing the equations of state.**

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Understand	The intensity variation of light due to interference, diffraction, and polarization.			L2
2	Analyze	The fundamentals of crystallography and X-ray diffraction.			L4
3	Apply	The basic concepts of dielectric and magnetic materials		for engineering applications.	L3
4	Analyze	The fundamentals of Quantum mechanics and interpret the nanomaterials		for engineering problems.	L4
5	Analyze	The charge carrier dynamics in semiconductors.	By implementing the equations of state.		L4

UNIT I Wave Optics **10 Hrs**

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Newton's Rings, Determination of wavelength and refractive index.
Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit (Qualitative) – Diffraction Grating.
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 **8 Hrs**

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 **8 Hrs**

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 - Frequency dependence of polarization-Applications of Dielectric materials.

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 - Applications of magnetic materials.

UNIT IV Quantum Mechanics and Nanomaterials 12 Hrs

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.

Nanomaterials: Introduction to Nanomaterials–Significance of nanoscale - Physical, Mechanical, Magnetic, and optical properties of nanomaterials –Synthesis of nanomaterials: Ball Milling, Applications of Nanomaterials.

UNIT V Semiconductors 10 Hrs

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 effectand its applications – Applications of semiconductors.

Textbooks:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G. Kshirsagar & TVS ArunMurthy, S. Chand Publications, 11th Edition 2019.
2. K.Thyagarajan "Engineering Physics",-Mc Graw Hill Publishing Company Ltd, 2016.
3. 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

Mapping of COs to POs and PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3												
2	3												
3	3			3									
4	3												
5	3			3									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	correlation	Verb	BTL			
1	15	22.3	3	Understand	L2	PO1	PO1: Apply (L3)	2
2	11	16.4	2	Analyze	L4	PO1	PO1: Apply (L3)	3
3	12	17.9	2	Apply	L3	PO1, PO4	PO1, PO4: Apply (L3)	3
4	13	19.4	2	Analyze	L4	PO1	PO1: Apply (L3)	3
5	16	23.8	3	Analyze	L4	PO1, PO4	PO1, PO4: Apply (L3)	3
	67							

CO1: The intensity variation of light due to interference, diffraction, and polarization.
Action Verb: Understand (L2)
PO1 Verbs: Apply (L3)

CO1 Action Verb is lesser than PO1 verb by one level; Therefore, correlation is moderate (2).

CO2: The fundamentals of crystallography.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)

CO2 Action Verb is greater than PO1 verb; Therefore correlation is high (3).

CO3: Apply the basic concepts of dielectric and magnetic materials for engineering applications.
Action Verb: Apply (L3)
PO1 and PO4 Verbs: Apply (L3)

CO3 Action Verb level is equal to PO1 and PO4 verb; Therefore correlation is high (3).

CO4: The fundamentals of Quantum mechanics and interpret the nanomaterials for engineering problems.
Action Verb: Analyze (L4)
PO1 Verb: Apply (L3)

CO4 Action Verb is greater than PO1 verb by one level; Therefore, correlation is high (3).

CO5: The charge carrier dynamics in semiconductors by implementing the equations of state.
Action Verb: Analyze (L4)
PO1 and PO4 Verb: Apply (L3)

CO5 Action verb is greater than PO1 verb; therefore, the correlation is high (3).

Annamacharya Institute of Technology & Sciences (Autonomous), Tirupati
AK23 Regulations

Year-Sem: I-I

Subject Code:23ABS9904	Subject Name: Linear Algebra and Calculus	L	T/CLC	P	Credits
		4	2	0	3

Course Outcomes (CO): Student will be able to

1. Analyze the matrix algebraic techniques for engineering applications.
2. Understand the concept of Eigen values, Eigen vectors and quadratic forms.
3. Analyze the mean value theorems for real time applications.
4. Apply the concepts of partial differentiation to functions of several variables.
5. Apply the multivariable integral calculus for computation of Area and Volume.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Analyze	the matrix algebraic techniques	for engineering applications.		**L4**
2	Understand	the concept of eigen values, eigen vectors and quadratic forms.	-		**L2**
3	Analyze	the mean value theorems	for real time applications.		**L4**
4	Apply	the concept of Maxima and Minima	to functions of several variables.		**L3**
5	Apply	the multivariable integral calculus	for computation of Area and volume.		**L3**

Unit I: Matrices **12hrs**

Rank of a matrix by Echelon form, Normal form, Cauchy-Binet formula (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: Eigen values, Eigen vectors and Orthogonal Transformation **9hrs**

Eigen values, Eigen vectors 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 **9hrs**

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

Unit IV: Partial differentiation and Applications(Multi Variable Calculus) **10hrs**

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 **10hrs**

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 (bydouble integrals and triple integrals).

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

References:

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., 25th Edition(9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5 th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, ,Pearson publishers, 9 th edition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021)

Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1		3											
2		2											
3		3											
4	3												
5	3												

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	correlation	Verb	BTL			
1	**10**	14	2	**Analyze**	**L4**	PO2	**Analyze**	3
2	**15**	21.4	3	**Understand**	**L2**	PO2	**Apply**	2
3	**15**	21.4	**3**	**Analyze**	**L4**	PO2	**Analyze**	3
4	**16**	22.8	**3**	**Apply**	**L3**	PO1	**Apply**	3
5	**14**	20	**3**	**Apply**	**L3**	PO1	**Apply**	3

Justification Statements

CO1: Analyze the matrix algebraic techniques that are needed for engineering applications.
Action Verb: Analyze(L4)
PO2 Verbs: Analyze (L4)
CO1 Action Verb is equal toPO2verb ; Therefore correlation is high (3).
CO2: Understand the concept of eigen values, eigen vectors and quadratic forms.
Action Verb: Understand (L2)
PO1 Verbs: Apply (L3)
CO2 Action Verb is low level to PO1 verb by one level; Therefore correlation is moderate (2).
CO3: Analyze the mean value theorems for real life problems.
Action Verb: Analyze **(L4)**
PO1 Verb: Analyze (L4)
CO3 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).
CO4: Apply the concept of Maxima and Minima of functions of several variables.
Action Verb: Apply (L3)
PO2 Verb: Apply (L3)
CO4 Action Verb level is equal to PO1 verb; Therefore correlation is high (3).
CO5: Apply the multivariable integral calculus for computation of area and volume.
Action Verb: Apply(L3)
PO1 Verb: Apply (L3)
CO5 Action verb is high level to PO1 verb; therefore the correlation is high (3).

Annamacharya Institute of Technology & Sciences (Autonomous), Tirupati
AK23 Regulations

Year-Sem	I-I	Branch of Study: Common to all Branches				
Subject Code		Subject Name	L	T	P	Credits
23AES0201		BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	0	0	3

PART-A

BASIC ELECTRICAL ENGINEERING

After completion of the course, students will be able to:	
CO1	Understand the fundamental laws of A. C circuits and D. C circuits.
CO2	Understand operating principles of motors, generators and measuring instruments.
CO3	Understand the fundamentals of power generation, costing and safety measures.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Bloom's level
CO1	Understand	The fundamentals laws of A. C circuits and D.C circuits.		A. C circuits and D. C circuits	L2
CO2	Understand	Operating principles of motors, generators and measuring instruments.			L2
CO3	Understand	The fundamentals of Power generation, costing and safety measures.			L2

SYLLABUS

UNIT-I

TITLE: 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

TITLE: 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

TITLE: 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

Text 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.

2 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, Person Publications, 2018, Second

Online learning resourses:

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

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

PART-B
BASIC ELECTRONICS ENGINEERING

After completion of the course, students will be able to:	
CO4	Understand the fundamental concepts of diodes, transistors and its applications.
CO5	Analyze the concepts of rectifiers, power supplies and amplifiers in electronics
CO6	Analyze the concepts of Number Systems, Boolean Functions, Logic Gates and Digital Circuits

CO	Action Verb	Knowledge Statement	Condition	Criteria	Bloom's level
CO4	Understand	Fundamental concepts of diodes, transistors and its applications			L2
CO5	Analyze	Concepts of rectifiers, power supplies and amplifiers in electronics			L4
CO6	Analyze	Concepts of Number Systems, Boolean Functions, Logic Gates and Digital Circuits			L4

SYLLABUS

UNIT-I

TITLE: 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

TITLE: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a DC power supply, working of a 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

TITLE: 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 Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Text books:

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

References:

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.

Mapping of Course outcomes with Program outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**2**	**2**				**1**						**2**	
CO2	**2**	**1**				**1**						**1**	
CO3	**2**	**1**				**2**						**1**	**2**
CO4	**2**	**3**											
CO5	**3**	**3**											
CO6	**3**	**3**											
Levels of correlation, viz., 1. Low, 2. Moderate, 3. High													

Mapping of Course outcomes with Program outcomes Justification Table

CO No.	Lesson Plan (Hrs.)	%	CO correlation	Verb	BTL	Program Outcomes (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of correlation (0-3)
1	08	30	3	**Understand**	**L2**	PO1,PO2, PO6	PO1: Apply (L3)	2
							PO2: Identify (L3)	2
							PO6: Thumb Rule	1
2	08	30	3	**Understand**	**L2**	PO1, PO2,PO6	PO1: Apply (L3)	2
							PO2: Identify (L3)	1
							PO6: Thumb Rule	1
3	10	38	3	**Understand**	**L2**	PO1, PO2,PO6	PO1: Apply (L3)	2
							PO2: Identify (L3)	1
							PO6: Thumb Rule	2
4	08	30	3	Understand	**L2**	PO1,PO2	PO1: Apply (L3)	2
							PO2: Review (L2)	3
5	08	30	3	Analyze	**L4**	PO1,PO2	PO1: Apply (L3)	3

							PO2: Review (L2)	3
6	10	38	3	Analyze	**L4**	PO1,PO2	PO1: Apply (L3) PO2: Review (L2)	3 3

CO1: Understand the fundamental laws of AC and DC circuits.
Action Verb: Understand (L2)
PO1: Apply (L3)
CO1 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Identify (L3)
CO1 Action Verb is Less than PO2 verb by one level; Therefore, correlation is moderate (2).
PO6: Using thumb rule, CO1 correlates PO6 as low (1).
CO2: Understand operating principles of motors, generators, MC and MI instruments.
Action Verb: Understand (L2)
PO1: Apply (L3)
CO2 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO2 Action Verb is Less than PO2 verb by two level; Therefore, correlation is low (1).
PO6: Using thumb rule, CO2 correlates PO6 as low (1).
CO3: Understand the fundamentals of power generation, costing and safety measures.
Action Verb: Understand (L2)
PO1: Apply (L3)
CO3 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO3 Action Verb is Less than PO2 verb by two level; Therefore, correlation is low (1).
PO6: Using thumb rule, CO3 correlates PO6 as medium (2).
CO4: Understand the fundamental concepts of diodes, transistors and its applications
Action Verb: Understand (L2)
PO1 Verbs: Apply (L3)
CO4 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2). PO2
Verbs: Review (L2)
CO4 Action Verb is equal to PO2 verb; Therefore correlation is high (3).
CO5: Analyze the concepts of rectifiers, power supplies and amplifiers in electronics.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO5 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).
PO2 Verbs: Review (L2)
CO5 Action Verb is equal to PO2 verb; Therefore correlation is high (3).
CO6: Analyze the concepts of Number Systems, Boolean Functions, Logic Gates and Digital Circuits.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO6 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).
PO2 Verbs: Review (L2)
CO6 Action Verb is equal to PO2 verb; Therefore correlation is high (3).

Annamacharya Institute of Technology & Sciences (Autonomous), Tirupati
AK23 Regulations

Year: I **Semester: I** **Branch of Study: Common to all Branches**

Subject Code	Subject Name	L	T	P	Credits
23AES0301	Engineering Graphics	1	0	4	3

Course Outcomes:

CO: 1 Apply the concepts of engineering curves and scales for technical drawing.

CO: 2 Understand the quadrant system to locate the position of points, lines and planes.

CO: 3 Analyze the projection of solids located in quadrant system.

CO: 4 Analyze the sectional views and development of surfaces of regular solids.

CO: 5 Apply orthographic and isometric projections concepts to construct the given object

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Apply	the concepts of engineering curves and scales	For technical drawing		L3
CO2	Understand	the quadrant system to locate the position of points, lines and planes			L2
CO3	Analyze	the projection of solids	located in quadrant system		L4
CO4	Analyze	the sectional views and development of surfaces	Of regular solids		L4
CO5	Apply	orthographic and isometric projections concepts to construct the given object			L3

Unit I: Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

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

Scales: Plain scales, diagonal scales and vernier scales.

Unit II

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

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; plane inclined to both the reference planes.

Unit III

Projections of Solids: Types of solids: Poly hedra 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 AutoCAD (*Not for end examination*).

Text Books:

1. K.L. Narayana & P. Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N.D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers

Reference Books:

1. Engineering Drawing, K.L. Narayana and P.Kannaiah, Tata McGrawHill,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.

Course Title	COs	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
Engineering Graphics	CO1	3		3							3		2	2
	CO2	2		2							3		2	2
	CO3	2		2							3		2	2
	CO4	3		3							3		2	2
	CO5	3		3							3		2	2

Correlation Matrix

CO	CO					Program Outcomes (PO)	PO(s): Action Verb and BTL (for PO1 to PO5)	Level of Correlation
	Lesson Plan (Hrs)	%	Correlation	Verb	BTL			
1	18	24	3	Apply	L3	PO1 PO2 PO10	Apply (L3) Develop (L3) Thumb Rule	3 3 3
2	15	20	2	Understand	L2	PO1 PO2 PO10	Apply (L3) Develop (L3) Thumb Rule	2 2 3
3	15	20	2	Analyze	L4	PO1 PO2 PO10	Apply (L3) Develop (L3) Thumb Rule	3 3 3
4	15	20	2	Analyze	L4	PO1 PO2 PO10	Apply (L3) Develop (L3) Thumb Rule	3 3 3
5	12	16	2	Apply	L3	PO1 PO2 PO10	Apply (L3) Develop (L3) Thumb Rule	3 3 3

Justification Statements:

CO1: Apply the concepts of engineering curves and scales for technical drawing.
Action Verb: Apply(L3)
PO1Verb:**Apply(L3)**

CO1 Action verbissamelevelasPO1 verb. Therefore, the correlation is high(3)
PO2 Verb: **Develop(L3)**
CO1 Action verb is same level as PO2 verb. Therefore, the correlation is high(3)
PO10Verb: Thumb Rule (TR)
CO1: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas, concepts and specifications. Therefore, the correlation is high(3)

CO2: Understand the quadrant system to locate the position of points, lines and planes.
Action Verb: Understand(L2)
PO1 Verb: **Apply(L3)**

CO2: Action verb is less than PO1 verb by one level. Therefore, the correlation is medium(2)

PO2 Verb: **Develop(L3)**
CO2: Action verb is less than PO2 verb by one level. Therefore, the correlation is medium(2)
PO10 Verb: Thumb Rule(TR)
CO2: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas, concepts and specifications. Therefore, the correlation is high(3)

CO3:Analyze the projection of solids located in quadrant system.
Action Verb: Analyze(L4)
PO1 Verb: **Apply(L3)**

CO3: Action verb is same level as PO1 verb. Therefore, the correlation is high(3)
PO2 Verb: **Develop(L3)**
CO3: Action verb is same level as PO2 verb. Therefore, the correlation is high(3)
PO10 Verb: Thumb Rule (TR)
CO3: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas, concepts and specifications. Therefore, the correlation is high(3)

CO4: Analyze the sectional views and development of surfaces of regular solids
Action Verb: Analyze(L4)
PO1 Verb: **Apply(L3)**

CO4: Action verb is same level as PO1 verb. Therefore, the correlation is high(3)
PO2 Verb: **Develop(L3)**
CO4: Action verb is same level as PO2 verb. Therefore, the correlation is high(3)
PO10 Verb: Thumb Rule (TR)
CO4: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas, concepts and specifications. Therefore, the correlation is high(3)

CO5: Apply orthographic and isometric projections concepts to construct the given object**.**
Action Verb: Apply(L3)
PO1 Verb: **Apply(L3)**

CO5: Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Develop(L3)**
CO5: Action verb is same level as PO2 verb. Therefore, the correlation is high(3)
PO10 Verb: Thumb Rule (TR)
CO5: Engineering graphics involves creating visual representations and technical drawings to communicate design ideas, concepts and specifications. Therefore, the correlation is high(3)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)

Course Code	Year & Sem	INTRODUCTION TO PROGRAMMING	L	T / CLC	P	C
23AES0501	I-I	(Common to All branches of Engineering)	4	2	0	3

Course Outcomes:

After studying the course, student will be able to

CO 1: **Understand** the computer Programming concepts and Algorithms.
CO 2: **Analyze** the control structures to implement basic programs.
CO 3: **Understand** the concept of Arrays and string to manipulate the stored data.
CO 4: **Create** the dynamic memory allocation using pointers and structures.
CO 5: **Create** the user defined functions and files for modifying stored data.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Understand	The computer Programming concepts and Algorithms.			L2
CO2	Analyze	the control structures		to implement basic programs.	L4
CO3	Understand	the concept of Arrays and string		to manipulate the stored data	L2
CO4	Create	the dynamic memory allocation	using pointers and structures.		L6
CO5	Create	user defined functions and files		for modifying stored data.	L6

UNIT - I	Introduction to Programming and Problem Solving	10 Hrs
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**	**9 Hrs**
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do- while) Break and Continue.		
UNIT - III	**Arrays and Strings**	**9 Hrs**
Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.		
UNIT - IV	**Pointers & User Defined Data types**	**9 Hrs**
Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.		
UNIT - V	**Functions & File Handling**	**9 Hrs**
Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling		

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, RemaTheraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

Mapping of course outcomes with program outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	2									3	
CO2	3	3	3								2	2	
CO3	2	3									2	2	
CO4	3	3	3								2	2	
CO5	3	3	3									2	2

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Correlation matrix

Unit No.	CO					Program Outcome (PO)	PO(s) :Action Verb and BTL(for PO1 to PO11)	Level of Correlation (0-3)
	Lesson plan(Hrs)	%	Correlation	Co's Action verb	BTL			
1	19	25%	3	CO1: Understand	L2	PO1 PO2 PO3	PO1: Apply(L3) PO2: Review(L2) PO3:Develop(L3)	2 3 2
2	10	14%	2	CO2: Analyze	L4	PO1 PO2 PO3 PO11	PO1: Apply(L3) PO2: Analyze (L4) PO3: Develop (L3) PO11: Thumb rule	3 3 3 2
3	19	25%	3	CO3: Understand	L2	PO1 PO2 PO11	PO1: Apply(L3) PO2: Review (L2) PO1: Thumb rule	2 3 2
4	15	20%	2	CO4: Create	L6	PO1 PO2 PO3 PO11	PO1: Apply(L3) PO2: Review (L2) PO3: Develop (L3) PO11: Thumb rule	3 3 3 2
5	12	16%	2	CO5: Create	L6	PO1 PO2 PO3 PO11	PO1: Apply(L3) PO2: Review(L2) PO3: Develop (L3) PO11: Thumb rule	3 3 3 3
	75	100 %						

Justification Statements :

CO1: Understand the computer Programming concepts and Algorithms.
Action Verb: Understand (L2)
PO1 Verb: Apply (L3)
CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)
PO2 Verb: Review (L2)
CO1 Action verb is same as than as PO2 verb by two level. Therefore, the correlation is High (3)
PO3 Verb: Develop (L3)
CO1 Action verb is less than as PO2 verb by one level. Therefore, the correlation is moderate (2)

CO2: Analyze the control structures to implement basic programs**.**

Action Verb: Analyze (L4)

PO1: Apply (L3)

CO2 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)

PO2: Analyze (L4)

CO2 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)

PO3: Develop (L3)

CO2 Action verb is greater than PO3 verb. Therefore, the correlation is high (3)

PO11: Thumb rule

Some of the flow of control statements knowledge are used to solve various problems. Therefore, the correlation is moderate (2)

CO3:Understand the concept of Arrays and string to manipulate the stored data.

Action Verb: Understand(L2)

PO1: Apply (L3)

CO3 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)

PO2: Review (L2)

CO3 Action verb is Same as PO2 verb. Therefore, the correlation is High (3)

PO11: Thumb rule

For some matrix operations array and string concepts were used Therefore, the correlation is moderate (2)

CO4: Create the dynamic memory allocation using pointers and structures.

Action Verb: Create (L6)

PO1: Apply (L3)

CO4 Action verb is greater than PO1 verb by two levels. Therefore, the correlation is high (3)

PO2: Review (L2)

CO4 Action verb is greater than as PO2 verb. Therefore, the correlation is high (3)

PO3: Develop (L3)

CO4 Action verb is greater than PO3 verb. Therefore, the correlation is high (3)

PO11: Thumb rule

For some mathematical operations Pointers and structures are used to manipulate the memory references. Therefore, the correlation is moderate (2)

CO5: Create the user defined functions and files for modifying stored data.

Action Verb: Create (L6)

PO1: Apply (L3)

CO5 Action verb is greater than PO1 verb by two levels. Therefore, the correlation is high (3)

PO2: Review (L2)

CO5 Action verb is greater than as PO2 verb. Therefore, the correlation is high (3)

PO3: Develop (L3)

CO5 Action verb is greater than as PO3 verb. Therefore, the correlation is high (3)

PO11: Thumb rule

In today's world file handling techniques were used in most of the areas. Therefore, the correlation is high (3)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)

Course Code	Year & Sem	IT workshop	L	T	P	C
23AES0503	I-I	(Common to CSE, CIC, CSE(DS) & EEE)	0	0	2	1

Course Outcomes:

After studying the course, student will be able to

CO1: Understand The Process of Software Installation &Hardware troubleshooting.
CO2: Analyze the network configurations forcustomizing web pages and search engines.
CO3: Apply the basic editing function, formatting text & objects on a required content.
CO4: Apply the formulas, functions and visualizations to manage the data.
CO5: Understand the libraries and models of chatGPT to generate information.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Understand	The Process of Software Installation &Hardware troubleshooting.			L2
CO2	Analyze	the network configurations		for customizing web pages and search engines	L4
CO3	Apply	The basic editing function, formatting text & objects		on a required content	L3
CO4	Apply	the formulas, functions and visualizations		to manage the data	L3
CO5	Understand	The libraries and models of chatGPT		to generate information	L2

List of Experiments

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.[CO1]

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.[CO1]

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.[CO1]

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.[CO1]

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.[CO1]

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.[CO2]

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.[CO2]

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. [CO2]

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. [CO2]

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX 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 La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word. [CO3]

Task 2: Using La TeX 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 La TeX and Word. [CO3]

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. [CO3]

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. [CO3]

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. [CO4]

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text[CO4]

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, [CO4]

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting[CO4]

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. [CO4]

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts. [CO4]

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. [CO4]

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. [CO5]

• 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[CO5]

• 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. [CO5]

• 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

Mapping of course outcomes with program outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3										1	
CO2	3	3	3	3	3								
CO3	3	3	3	2	3						3	2	
CO4	3	3	3	2	3						3		2
CO5	2	2											1

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Correlation matrix

Unit No.	Co's Action verb	BTL	Program Outcome (PO)	PO(s) : Action Verb and BTL (for PO1 to PO11)	Level of Correlation (0-3)
1	CO1: Understand	L2	PO1 PO2	PO1: Apply(L3) PO2: Review(L2)	2 3
2	CO2: Analyze	L4	PO1 PO2 PO3 PO4 PO5	PO1: Apply(L3) PO2: Identify (L3) PO3: Develop(L3) PO4: Analyze (L4) PO5: Apply (L3)	3 3 3 3 3
3	CO3: Apply	L3	PO1 PO2 PO3 PO4 PO5	PO1: Apply(L3) PO2: Review (L2) PO3: Develop(L3) PO4: Analyze (L4) PO5: Apply (L3)	3 3 3 2 3

			PO11	PO11: Thumb rule	3
4	CO4: Apply	L3	PO1 PO2 PO3 PO4 PO5 PO11	PO1: Apply(L3) PO2: Review (L2) PO3: Develop(L3) PO4: Analyze (L4) PO5: Apply (L3) PO11: Thumb rule	3 3 3 2 3 3
5	CO5: Understand	L2	PO1 PO2	PO1: Apply(L3) PO2: Identify (L3)	2 2

Justification Statements :

CO1: Understand The Process of Software Installation &Hardware troubleshooting

Action Verb: Understand (L2)

PO1 Verb: Apply (L3)

CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)

PO2 Verb: Review(L2)

CO1 Action verb is same as PO2 verb. Therefore, the correlation is high (3)

CO2: Analyze the network configurations forcustomizing web pages and search engines

Action Verb: Analyze (L4)

PO1: Apply (L3)

CO2 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)

PO2: idetify(L3)

CO2 Action verb is greater than as PO2 verb. Therefore, the correlation is high (3)

PO3: Develop (L3)

CO2 Action verb is greater than as PO3 verb. Therefore, the correlation is high (3)

PO4: Analyze (L4)

CO2 Action verb is same as PO4 verb. Therefore, the correlation is high (3)

PO5: Apply (L3)

CO2 Action verb is greater than as PO5 verb. Therefore, the correlation is high (3)

CO 3: Apply The basic editing function, formatting text & objects on a required content.

Action Verb: Apply (L3)

PO1: Apply (L3)

CO3 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)

PO2: Review(L2)

CO3 Action verb is less than as PO2 verb. Therefore, the correlation is high(3)

PO3: Develop(L3)

CO3 Action verb is same as PO3 verb. Therefore, the correlation is high (3)

PO4: Analyze (L4)

CO3 Action verb is less than as PO4 verb. Therefore, the correlation is moderate (2)

PO5: Apply (L3)

CO3 Action verb is same as PO5 verb. Therefore, the correlation is high (3)

PO11: Thumb rule

Documentation and presentation is learning process to find the solution better manner the correlation is high (3)

CO 4: Apply the formulas, functions and visualizations to manage the data.

Action Verb: Apply (L3)

PO1: Apply (L3)

CO4 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)

PO2: identify(L3)

CO4 Action verb is greater than as PO2 verb. Therefore, the correlation is high (3)

PO3: Develop (L3)

CO4 Action verb is same as PO3 verb. Therefore, the correlation is high (3)

PO4: Analyze (L4)

CO4 Action verb is less than as PO4 verb by one level. Therefore, the correlation is moderate (2)

PO5: Apply (L3)

CO4 Action verb is greater than as PO5 verb. Therefore, the correlation is high (3)

PO11: Thumb rule

Spread sheets in Excel is the trending approach in the current days Therefore, the correlation is high (3)

CO 5: Understand the libraries and models of chatGPT to generate information.

Action Verb: Understand (L2)

PO1 Verb: Apply (L3)

CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)

PO2 Verb: Identify(L3)

CO1 Action verb is same as PO2 verb. Therefore, the correlation is moderate (2)

Annamacharya Institute of Technology & Sciences (Autonomous), Tirupati

AK23 Regulations

Common to I Sem ECE/ AI&DS/AI&ML/CE/ME & II Sem CSE/CIC/EEE/CSD

Subject Code: 23ABS9908	Subject Name: Engineering Physics Lab	L T P 0 0 2	Credits:1

Course Outcomes

CO1: Analyze the properties of light for engineering problems.
CO2: Evaluate the crystallite size using X-ray diffraction.
CO3: Analyze the basic properties of dielectric and magnetic behavior of the given material.
CO4: Determine the mechanical behavior of a given material.
CO5: Evaluate the basic parameters of a given semiconductor material.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Analyze	The properties of light		for engineering problems.	L4
2	Evaluate	The crystallite size using X-ray diffraction.			L5
3	Analyze	The basic properties of dielectric and magnetic behavior of the given material.			L4
4	Determine	The mechanical behavior of a given material.			L5
5	Evaluate	The basic parameters of a given semiconductor material.			L5

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings – CO1.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration – CO1.
3. Study the variation of B versus H by magnetizing the magnetic material (B-H curve) – CO3.
4. Determination of wavelength of Laser light using diffraction grating – CO1.
5. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method – CO3.
6. Determination of energy gap of a semiconductor using p-n junction diode – CO5.
7. Determination of the resistivity of semiconductors by four probe methods – CO5.
8. Determination of the crystallite size using X-Ray Diffraction spectra – CO2.
9. Determination of the numerical aperture of a given optical fiber and angle of acceptance – CO1.
10. Verification of Brewster's law – CO1.
11. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum – CO4.
12. Determination of rigidity modulus of the material of the given wire using Torsional pendulum – CO4.
13. Determination of temperature coefficients of a thermistor – CO5.
14. Determination of dielectric constant using charging and discharging method – CO3.
15. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect – CO5.
16. Sonometer: Verification of laws of stretched string – CO4.
17. Determination of magnetic susceptibility by Kundt's tube method – CO3.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment – CO4.

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.
URL: www.vlab.co.in

Mapping of COs to POs and PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3			3									
2	3			3									
3	3			3									
4	3			3									
5	3			3									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	correlation	Verb	BTL			
1	9	25	3	Analyze	L4	PO1, PO4	PO1: Apply (L3), PO4: Analyze (L4)	3 3
2	6	16	2	Evaluate	L5	PO1, PO4	PO1: Apply (L3), PO4: Analyze (L4)	3 3
3	9	25	3	Analyze	L4	PO1, PO4	PO1: Apply (L3), PO4: Analyze (L4)	3 3
4	6	16	2	Determine	L5	PO1, PO4	PO1: Apply (L3), PO4: Analyze (L4)	3 3
5	6	16	2	Evaluate	L5	PO1, PO4	PO1: Apply (L3), PO4: Analyze (L4)	3 3
	36							

Statements:

CO1: Analyze the properties of light for solving engineering problems.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
PO4 Verb: Analyze (L4)

CO1 Action Verb is greater than PO1 verb by one level; Therefore, correlation is high (3).
CO1 Action Verb is equal to PO4 verb; Therefore, correlation is high (3).

CO2: Evaluate the crystallite size using X-ray diffraction.
Action Verb: Evaluate (L5)
PO1 Verbs: Apply (L3)
PO4 Verb: Analyze (L4)

CO2 Action Verb is greater than PO1 verb by two levels; Therefore correlation is high (3).
CO2 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).

CO3: Analyze the basic properties of dielectric and magnetic behavior of the given material.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
PO4 Verb: Analyze (L4)

CO3 Action Verb level is greater than PO1 action verb by one level; Therefore correlation is high (3).
CO3 Action Verb level is equal to PO4 action verb; Therefore correlation is high (3).

CO4: Determine the mechanical behavior of a given material using dynamic methods.
Action Verb: Determine (L5)
PO1 Verbs: Apply (L3)
PO4 Verb: Analyze (L4)

CO4 Action Verb is greater than PO1 verb by two levels; Therefore correlation is high (3).
CO4 Action Verb is greater than PO4 verb by one level; Therefore correlation is high (3).

CO5: Evaluate the basic parameters of a given semiconductor material.
Action Verb: Evaluate (L5)
PO1 and PO4 Verb: Apply (L3)

CO5 Action Verb is greater than PO1 verb by two levels; Therefore correlation is high (3).
CO5 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).

Annamacharya Institute of Technology & Sciences (Autonomous), Tirupati

AK23 Regulations

Year-Sem	I-I	Branch of Study: Common to all Branches			
Subject Code	**Subject Name**	**L**	**T**	**P**	**Credits**
23AES0202	**ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP**	**0**	**0**	**3**	**1.5**

PART A
ELECTRICAL ENGINEERING LAB

After completion of the course, students will be able to:	
CO1	Understand the Electrical circuit design, measurement of resistance, power, and power factor.
CO2	Apply suitable methods to measure Resistance, power, energy and power factor.
CO3	Design suitable methods for magnetization characteristics of D.C shunt generator.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Bloom's level
CO1	Understand	Electrical circuit design; measurement of resistance, power, power factor			L2
CO2	Apply	Suitable methods to measure Resistance, power, energy and power factor.			L3
CO3	Design	Suitable methods for magnetization characteristics of D.C shunt generator.			L6

PART A
ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of Kirchhoff's current law and Voltage law- CO1
2. Verification of Superposition theorem- CO1
3. Measurement of Resistance using Wheatstone bridge- CO1
4. Measurement of Power and Power factor using Single-phase watt-meter- CO2
5. Measurement of Earth Resistance using Megger- CO2
6. Calculation of Electrical Energy for Domestic Premises- CO2
7. Magnetization Characteristics of DC Shunt Generator- CO3

Reference books:

1 Basic Electrical Engineering, D.C. Kulshreshtha, Tata Mc Graw Hill,2019,First Edition

2 Power System Engineering, P.V.Gupta, M.L.Soni, U.S.Bhatnagarand , A.Chakrabarti, DhanpatRai&Co,2013

3 Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014,Third Editio

Note: Minimum Six Experiments to be performed.

PART B
ELECTRONICS ENGINEERING LAB

After completion of the course, students will be able to:	
CO4	Understand the V-I Characteristics of diodes and its applications.
CO5	Analyze the input and output characteristics of BJT and its applications.
CO6	Analyze the truth tables of all logic gates and f/f's using IC's.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Bloom's level
CO4	Understand	V-I Characteristics of diodes and its applications.			L2
CO5	Analyze	Input and output characteristics of BJT and its applications			L4
CO6	Analyze	Truth tables of all logic gates and f/f's using IC's.			L4

PART B
ELECTRONICS ENGINEERING LAB

List of experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B)Reverse bias. (CO4)
2. Plot VI characteristics of Zener Diode and its application as voltage Regulator. (CO4)
3. Implementation of half wave and full wave rectifiers (CO4)
4. Plot Input & Output characteristics of BJT in CE and CB configurations (CO5)
5. Frequency response of CE amplifier. (CO5)
6. Simulation of RC coupled amplifier with the design supplied. (CO5)
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs. (CO6)
8. Verification of Truth Tables of S-R, J-K &D flipflops using respective ICs. (CO6)

Tools Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROS, and all the required active devices.

Reference books:

1 R.L.Boylestad&LouisNashlesky,ElectronicDevices&CircuitTheory,Pearson Education, 202
2 R.P.Jain,ModernDigitalElectronics,4thEdition,TataMcGrawHill,2009
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

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1		1					1			2	
CO2	3	2		2					1			2	
CO3		3		3					1			2	1
CO4	2	3											
CO5	3	3											
CO6	3	3											

Mapping of Course outcomes with Program outcomes Justification Table								
CO No.	**CO**					**Program Outcomes (PO)**	**PO(s): Action verb and BTL(for PO1 toPO5)**	**Level of correlation(0-3)**
	Lesson Plan(Hrs.)	**%**	**correlation**	**Verb**	**BTL**			
1				Understand	L2	PO1, PO2, PO4, PO9	PO1:Apply(L3) PO2:Analyze(L4) PO4:Analyze(L4) PO9:ThumbRule	2 1 1 1
2				Apply	L3	PO1, PO2, PO4, PO9	PO1:Apply(L3) PO2:Analyze(L4) PO4:Analyze(L4) PO9:ThumbRule	3 2 2 1
3				Design	L6	PO2, PO4, PO9	PO2:Analyze(L4) PO4:Design(L6) PO9:ThumbRule	3 3 1
4				Understand	L2	PO1, PO2	PO1:Apply(L3) PO2:Review(L2)	2 3
5				Analyze	L4	PO1, PO2	PO1:Apply(L3) PO2:Review(L2)	3 3
6				Analyze	L4	PO1, PO2	PO1:Apply(L3) PO2:Review(L2)	3 3

CO1: Understand the Electrical circuit design, measurement of resistance, power, and power factor.
Action Verb: Understand(L2)

PO1: Apply (L3)

CO1 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate(2).

PO2: Analyze (L4)

CO1 Action Verb is Less than PO2 verb by two level; Therefore, correlation is low(1).

PO4: Analyze (L4)

CO1 Action Verb is Less than PO4 verb by two level; Therefore ,correlation is low(1).

PO9: Using Thumb Rule, CO1 correlates to PO9 as low (1).

CO2: Apply suitable methods to measure Resistance, power, energy and power factor.
Action Verb: Apply(L3)

PO1: Apply (L3)

CO2 Action Verb is same as PO1 verb; Therefore, correlation is high(3). PO2: Analyze (L4)

CO2 Action Verb is Less than PO2 verb by one level; Therefore, correlation is moderate(2).

PO4: Analyze (L4)

CO2 Action Verb is Less than PO4 verb by one level; Therefore, correlation is moderate(2).

Using Thumb Rule, CO2 correlates to PO9 as low (1).

CO3: Design suitable methods for magnetization characteristics of D.C shunt generator.
Action Verb: Design(L6)

PO2: Analyze (L4)

CO3 Action Verb is greater than PO2 verb by two level ;Therefore, correlation is high(3).

PO4: Design (L6)

CO3ActionVerbissameasPO4verb;Therefore, correlation is high(3).

PO9: Using Thumb Rule, CO3 correlates to PO9 as low (1).

CO4: Understand the V-I Characteristics of diodes and its applications.

Action Verb: Understand (L2)

PO1 Verbs: Apply (L3)

CO4 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate(2)

PO2 Verbs: Review (L2)

CO4ActionVerb is equal to PO2 verb; Therefore correlation is high(3).

CO5: Analyze the input and output characteristics of BJT and its applications.

Action Verb: Analyze (L4)

PO1Verbs:Apply (L3)

CO5 Action Verb is greater than PO1 verb by one level; Therefore correlation is high(3).

PO2 Verbs: Review (L2)

CO5 Action Verb is equal to PO2 verb; Therefore correlation is high(3). **CO6: Analyze the truth tables of all logic gates and f/f's using IC's. Action Verb: Analyze (L4)**

PO1Verbs:Apply (L3)

CO6 Action Verb is greater than PO1 verb by one level; Therefore correlation is high(3). PO2 Verbs: Review (L2)

CO6 Action Verb is equal to PO2 verb; Therefore correlation is high(3).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(AUTONOMOUS)
COMPUTER SCIENCE AND ENGINEERING (CSE)

Course Code	Year & Sem	COMPUTER PROGRAMMING LAB (Common to All Branches of Engineering)	L	T	P	C
23AES0502	I-I		0	0	3	1.5

Course Outcomes:

After studying the course, student will be able to

CO1: Understand the basic syntax of C program to build applications.
CO2: Create the control structure for solving complex problems.
CO3: Apply the concepts of arrays, functions, basic concepts of pointers to organize the data.
CO4: Apply the concepts of structures, unions and linked list to manage heterogeneous data .
CO5: Create the file applications for storing and accessing data.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	**Understand**	the basic syntax of C program		to build applications	L2
CO2	**Create**	the control structure		for solving complex problems	L6
CO3	**Apply**	the concepts of arrays, functions, basic concepts of pointers		to organize the data	L3
CO4	**Apply**	the concepts of structures, unions and linked list		to manage heterogeneous data	L3
CO5	**Create**	the file applications		for storing and accessing data	L6

List of Experiments:

Exercise 1: Problem-solving using Computers[CO1]

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

Exercise 2: Problem-solving using Algorithms and Flow charts.[CO1]

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

Exercise 3: Variable types and type conversions[CO2]

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

Exercise 4: Operators and the precedence and as associativity [CO2]

i) 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)

ii) Find the maximum of three numbers using conditional operator

iii) Take marks of 5 subjects in integers, and find the total, average in float

list and perform insertion, deletion, and traversal.

Exercise 5: Branching and logical expressions[CO2]

i) Write a C program to find the max and min of four numbers using if-else.

ii) Write a C program to generate electricity bill.

iii) Find the roots of the quadratic equation.

iv) Write a C program to simulate a calculator using switch case.

v) Write a C program to find the given year is a leap year or not.

Exercise 6: Loops, while and for loops[CO2]

i) Find the factorial of given number using any loop.

ii) Find the given number is a prime or not.

iii) Compute sine and cos series

iv) Checking a number palindrome

iv) Construct a pyramid of numbers.

Exercise 7: 1 D Arrays: searching[CO3]

i) Find the min and max of a 1-D integer array.

ii) Perform linear search on1D array.

iii) The reverse of a 1D integer array

iv) Find 2's complement of the given binary number.

v) Eliminate duplicate elements in an array.

Exercise 8: 2 D arrays, sorting and Strings[CO3]

i) Addition of two matrices

ii) Multiplication two matrices

iii) Sort array elements using bubble sort

iv) Concatenate two strings without built-in functions

v) Reverse a string using built-in and without built-in string functions

Exercise 9: Pointers, structures and dynamic memory allocation[CO3]

i. Write a C program to find the sum of a 1D array using malloc()

ii. Write a C program to find the total, average of n students using structures

iii. Enter n students data using calloc() and display failed students list

iv. Read student name and marks from the command line and display the student details along with the total.

v. Write a C program to implement realloc()

Exercise 10:Bitfields, Self-Referential Structures, Linked lists[CO4]

i) Create and display a singly linked list using self-referential structure.

ii) Demonstrate the differences between structures and unions using a C program.

iii) Write a C program to shift/rotate using bitfields.

iv) Write a C program to copy one structure variable to another structure of the same type.

Exercise 11:Functions, call by value, scope and extent[CO2]

i) Write a C function to calculate NCR value.

ii) Write a C function to find the length of a string.

iii) Write a C function to transpose of a matrix.

iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

Exercise 12:Recursion, the structure of recursive calls[CO4]

i) Write a recursive function to generate Fibonacci series.

ii) Write a recursive function to find the lcm of two numbers.

iii) Write a recursive function to find the factorial of a number.

iv) Write a C Program to implement Ackermann function using recursion.

v) Write a recursive function to find the sum of series.

Exercise 13: Call by reference, dangling pointers[CO4]

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

ii) Demonstrate Dangling pointer problem using a C program.

iii) Write a C program to copy one string into another using pointer.

v) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

Exercise 14: File handling[CO5]

i) Write a C program to write and read text into a file.

ii) Write a C program to write and read text into a binary file using fread() and fwrite()

iii) Copy the contents of one file to another file.

iv) Write a C program to merge two files into the third file using command-line arguments.

v) Find no. of lines, words and characters in a file

vi) 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

Mapping of course outcomes with program outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	2	2								2	
CO2	3	3		3							2	2	
CO3	3	3		2	3						3	2	
CO4	3	3	3	2							2	2	
CO5	3	3	3	3							3	2	

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

Correlation matrix

Unit No.	Co's Action verb	BTL	Program Outcome (PO)	PO(s) : Action Verb and BTL (for PO1 to PO11)	Level of Correlation (0-3)
1	CO1: understand	L2	PO1 PO2 PO3 PO4	PO1: Apply(L3) PO2: Review(L2) PO3: Develop(L3) PO4: Analyze(L4)	2 3 2 2
2	CO2: Create	L6	PO1 PO2 PO4 PO5 PO11	PO1: Apply(L3) PO2: Review (L3) PO4: Analyze (L4) PO5: Apply(L3) PO11: Thumb rule	3 3 3 3 2
3	CO3: Apply	L3	PO1 PO2 PO4 PO5 PO11	PO1: Apply(L3) PO2: Review (L3) PO4: Analyze (L4) PO5: Apply(L3) PO11: Thumb rule	3 3 2 3 3

4	CO4: Apply	L3	PO1 PO2 PO3 PO4 PO11	PO1: Apply(L3) PO2: Review (L2) PO3: Develop(L3) PO4: Analyze (L4) PO11: Thumb rule	3 3 3 2 2
5	CO5: Create	L6	PO1 PO2 PO3 PO4 PO11	PO1: Apply(L3) PO2: Review(L2) PO3: Develop(L3) PO4: Analyze (L4) PO11: Thumb rule	3 3 3 3 3

Justification Statements :

CO1: Understand the basic syntax of C program to build applications.

Action Verb: Understand (L2)

PO1 Verb: Apply (L3)

CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate (2)

PO2 Verb: Review(L2)

CO1 Action verb is greater than PO2 verb. Therefore, the correlation is high (3)

PO3: Develop(L3)

CO1 Action verb is less than PO3 verb by one level. Therefore, the correlation is moderate (2)

PO4: Analyze(L4)

CO1 Action verb is less than PO1 verb by one level. Therefore, the correlation is moderate is (2)

CO2: Create the control structure for solving complex problems.

Action Verb: Create (L6)

PO1: Apply (L3)

CO2 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)

PO2: Review (L3)

CO2 Action verb is same level PO2 verb. Therefore, the correlation is high (3)

PO4: Analyze (L4)

CO2 Action verb is same as PO4 verb. Therefore, the correlation is high (3)

PO5: Apply(L3)

CO2 Action verb is same as PO5 verb. Therefore, the correlation is high (3)

PO11: Thumb rule

For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (2)

CO3: Apply the concepts of arrays, functions, basic concepts of pointers to organize the data..

Action Verb: Apply (L3)

PO1: Apply (L3)

CO3 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)

PO2: Review (L3)

CO3 Action verb is same level PO2 verb. Therefore, the correlation is high (3)

PO4: Analyze (L4)

CO3 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2)

PO5: Apply(L3)

CO3 Action verb is same as PO5 verb. Therefore, the correlation is high (3)

PO11: Thumb rule

For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (3)

CO4: Apply the concepts of structures, unions and linked list to manage heterogeneous data.
Action Verb: Apply (L3)
PO1: Apply (L3)
CO4 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
PO2: Review (L3)
CO4 Action verb is same level PO2 verb. Therefore, the correlation is high (3)
PO4: Analyze (L4)
CO4 Action verb is less than PO4 verb by one level. Therefore, the correlation is moderate (2)
PO5: Apply(L3)
CO4 Action verb is same as PO5 verb. Therefore, the correlation is high (3)
PO11: Thumb rule
For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (2)

CO5: Create the file applications for storing and accessing data.
Action Verb: Create (L6)
PO1: Apply (L3)
CO5 Action verb is greater than as PO1 verb. Therefore, the correlation is high (3)
PO2: Review (L3)
CO5 Action verb is same level PO2 verb. Therefore, the correlation is high (3)
PO4: Analyze (L4)
CO5 Action verb is same as PO4 verb. Therefore, the correlation is high (3)
PO5: Apply(L3)
CO5 Action verb is same as PO5 verb. Therefore, the correlation is high (3)
PO11: Thumb rule
For some of Linear Data Structure applications, Linked lists concepts are used to write programs store the data. Therefore, the correlation is high (3)

Annamacharya Institute of Technology & Sciences (Autonomous), Tirupati

AK23 Regulations

Common to I SEM ECE/AI&DS/AI&ML/CE/ME & II SEM CSE/CIC/CSD/EEE

Subject Code	Subject: Name	L	T	P	CREDITS
23AHM9904	NSS/NCC/SCOUTS&GUIDES/ COMMUNITY SERVICE	0	0	1	0.5

Course Outcomes: After studying the course, students will be able to

CO1:	Understand the importance of discipline, character and service motto of community.
CO2:	Analyze the activities need to be done for nature protection
CO3:	Analyze the social issues in a community and address it through the base camps.

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	the importance of discipline, character and service motto		of community	L1
CO2	Analyze	the activities need to be done for nature protection			L4
CO3	Analyze	the social issues in a community and address it through the base camps			L4

UNIT-I

Orientation
General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, careerguidance.
Activities:
Conducting –ice breaking sessions-expectations from the course-knowing personaltalents and skills
Conducting orientations programs for the students –future plans-activities-releasingroad map etc.
Displaying success stories-motivational biopics- award winning movies on societalissues etc.
Conducting talent show in singing patriotic songs-paintings- any other contribution

UNIT-II

Nature & Care
Activities:
Best out of waste competition.
Poster and signs making competition to spread environmental awareness.
Recycling and environmental pollution article writing competition.
Organizing Zero-waste day.
Digital Environmental awareness activity via various social media platforms.
Virtual demonstration of different eco-friendly approaches for sustainable living.
Write a summary on any book related to environmental issues.

UNIT-III

Community Service
Activities:
Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
Mental health, Spiritual Health, HIV/AIDS,
Conducting consumer Awareness. Explaining various legal provisions etc.
Women Empowerment Programmes- Sexual Abuse, Adolescent Health and PopulationEducation.
Any other programmes in collaboration with local charities, NGOs etc.
Conducting awareness programs on Health-related issues such as General Health,

CORRELATION OF COS WITH THE POS & PSOS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2								2			2
CO2	3	3								3			2
CO3	3	3								3			2

CO-POMAPPING JUSTIFICATION:

Unit No	**Course Outcomes**		**Program Outcome (PO)**	**PO(s):Action Verb and BTL(forPO1 to PO11)**	**Level of Correlation (0-3)**
	CO's Action Verb	**BTL**			
1	Understand	L2	PO1 PO2 PO10	Apply(L3) Analyze(L4) Thumb Rule	2 2 2
2	Analyze	L4	PO1 PO2 PO10	Apply(L3) Analyze(L4) Thumb Rule	2 3 3
3	Analyze	L4	PO1 PO2 PO10	Apply(L3) Analyze(L4) Thumb Rule	2 3 3

Justification Statements:

CO1: Understand the importance of discipline, character and service motto of community.
Action Verb: Understand (L2)

CO1 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2).
CO1 Action Verb is less than PO2 verb by one level; Therefore correlation is moderate (2).
CO1 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO10 as moderate (2).

CO2: Analyze the activities need to be done for nature protection
Action Verb: Analyze (L4)

CO2 Action Verb is greater than PO1 verb by one level; Therefore correlation is moderate (2).
CO2 Action Verb is same as PO2 verb, Therefore correlation is High (3)
CO2 Action Verb is of BTL 4. Using Thumb rule, L4 correlates PO10 as moderate (4).

CO3: Analyze the social issues in a community and address it through the base camps
Action Verb: Analyze (L4)

CO3 Action Verb is greater than PO1 verb by one level; Therefore correlation is moderate (2).
CO3 Action Verb is same as PO2 verb, Therefore correlation is High (3)
CO3 Action Verb is of BTL 4. Using Thumb rule, L4 correlates PO10 as moderate (4).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES:: TIRUPATI
(AUTONOMOUS)
AK23-REGULATIONS
B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.– I Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T/CLC	P	C			
1	HM	23AHM9901	Communicative English	2	2	0	2	30	70	100
2	BS	23ABS9901	Chemistry	4	2	0	3	30	70	100
3	BS	23ABS9905	Differential Equations and Vector Calculus	4	2	0	3	30	70	100
4	ES	23AES0101	Basics of Civil & Mechanical Engineering	3	0	0	3	30	70	100
5	PC	23APC0203	Network Analysis	3	0	0	3	30	70	100
6	HM	23AHM9902	Communicative English Lab	0	0	2	1	30	70	100
7	BS	23ABS9906	Chemistry Lab	0	0	2	1	30	70	100
8	ES	23AES0302	Engineering Workshop	0	0	3	1.5	30	70	100
9	PC	23APC0204	Network Analysis and Simulation Laboratory	0	0	3	1.5	30	70	100
10	HM	23AHM9903	Health and Wellness, Yoga and Sports	0	0	1	0.5	50	-	50
Total				16	6	11	19.5	320	630	950

Annamacharya Institute of Technology & Sciences :: Tirupati
(Autonomous)
AK23 Regulations

(Effective for the batches admitted from 2023-24)

Year: I B.Tech **(Common to all branches)** **Semester: II**

Subject Code	Subject Name	L	T	P	Credit: 2	CLC
23AHM9901	COMMUNICATIVE ENGLISH	2	0	0		2

Pre-Requisites	Communicative English	Semester	I & II

Course Outcomes (CO): Student will be able to

CO1: Understand reading / listening texts and to write summaries based on global comprehension of these texts.**(Listening & Reading)**
CO2: Apply grammatical structures to formulate sentences and correct word forms.**(Grammar)**
CO3: Analyze discourse markers to speak clearly on a specific topic in formal and informal conversations.(**Speaking)**
CO4: Analyze a coherent paragraph interpreting graphic elements, figure/graph/chart/table**(Read & Write)**
CO5: Create a coherent essay, letter writing, report writing and design a resume.**(Writing)**

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Understand	reading / listening texts and to write summaries based on global comprehension of these texts.			L2
2	Apply	grammatical structures to formulate sentences and correct word forms			L3
3	Analyze	Analyze discourse markers to speak clearly on a specific topic in formal and informal conversations...			L4
4	Analyze	coherent paragraph interpreting a graphic elements.			L4
5	Create	coherent essay, letter writing, report writing and design a resume			L6

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**.**
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, Cover letters
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: Idiom and phrases & Phrasal verbs

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:

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

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

Correlation of COs with the POs & PSOs for B.Tech
AK-23 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1									2				
2								2	2				
3									3				
4									3				
5									3				

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	corr	Verb	BTL			
1	12	22	3	**Understand**	**L2**	PO9	Thumb Rule	2
2	12	22	3	**Apply**	**L3**	PO8,PO9	Thumb Rule	2,2
3	10	18	**2**	**Analyze**	**L4**	PO9	Thumb Rule	3
4	10	18	**2**	**Analyze**	**L4**	PO9	Thumb Rule	3
5	10	18	**2**	**Create**	**L6**	PO9	Thumb Rule	3

CO1: Understand reading / listening text and to write summaries based on global comprehension of these texts.
Action Verb: Understand (L2)

CO1 Action Verb Understand is of BTL 2. Using Thumb rule, L2 correlates PO6 to PO11 as moderate (2).

CO2: Apply grammatical structures to formulate sentences and correct word forms.
Action Verb: Apply (L3)
CO2 Action Verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 to PO11 as moderate (2) & (2)

CO3: Analyze discourse markers to speak clearly on a specific topic in Formal and informal Conversations.
Action Verb: Analyze (L4)
CO3 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 to PO11 as high (3).

CO4: Analyze a coherent paragraph interpreting graphic elements, figure/graph/chart/table **(Read & Write)**
Action Verb: Analyze (L4)

CO4 Action Verb Analyze is of BTL 4. Using Thumb rule, L6 correlates PO6 to PO11 as high (3).

CO5: Create a coherent essay, letter writing, report writing and design a resume.(Writing)
Action Verb: Create(L6)

CO5 Action Verb Create is of BTL 6. Using Thumb rule, L5 correlates PO6 to PO11 as high (3).

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(Effective for the batches admitted from 2023-24)

Year: I B.Tech **Common to ECE,AI&DS,AI&ML II Sem**

Subject Code: 23ABS9901	Subject Name: Chemistry	L	T/CLC	P	Credits
		4	2	0	3

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

1. **Understand the interaction of energy levels between atoms and molecules**
2. **Apply the principle of Band diagrams in the conductors and semiconductors**
3. **Apply the electrochemical principles to the construction of batteries, fuel cells and sensors**
4. **Analyze the preparation and mechanism of plastics, Elastomers and conducting polymers**
5. **Analyze the separation of liquid mixtures using instrumental methods.**

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	**Understand**	the interaction of energy levels		between atoms and molecules	L2
2	**Apply**	principle of Band diagrams	conductors and semiconductors		L3
3	**Apply**	electrochemical principles to the construction of batteries, fuel cells and sensors			L3
4	**Analyze**	preparation and mechanism of plastics, Elastomers and conducting polymers			L4
5	**Analyze**	the separation of liquid mixtures	using instrumental methods		L4

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 heteronuclear 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-oxygenfuel 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), Polyl 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, DhanpatRai, 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

Mapping of COs to POs and PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	2												
2	3												
3	3												
4		3											
5		3											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours				CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Register (Hrs)	Lesson Plan (Hrs)	%	corr	Verb	BTL			
1	**10**	**10**	**15.6**	**2**	**Understand**	**L2**	PO1	PO1: Apply (L3)	2
2	**10**	**17**	**26.5**	**3**	**Apply**	**L3**	PO1	PO1: Apply (L3)	3
3	**10**	**12**	**18.7**	**3**	**Apply**	**L3**	PO2	PO1: Apply (L3)	3
4	**10**	**13**	**20.3**	**3**	**Analyze**	**L4**	PO2	PO2: Analyze (L4)	3
5	**10**	**12**	**18.7**	**3**	**Analyze**	**L4**	PO1	PO2: Analyze (L4)	3

Statements:

CO1: Understand the fundamentals of Atoms and Molecules

Action Verb: Understand (L2)

PO1 Verbs: Apply (L3)

CO1 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2).

CO2: Apply electrochemical principles to construct batteries

Action Verb: Apply (L3)

PO1 Verbs: Apply (L3)

CO2 Action Verb is equal to PO1 verb; Therefore correlation is high (3).

CO3: Apply electrochemical principles to the construction of batteries, fuel cells and electrochemical sensors

Action Verb: Apply (L3)

PO2 Verb: Apply (L3)

CO3 Action Verb level is equal to PO1 verb; Therefore correlation is high (3).

CO4: Analyze the preparation and mechanism of polymers

Action Verb: Analyze (L4)

PO2 Verb: Analyze (L4)

CO3 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

CO5: Analyze the identification of individual components

Action Verb: Analyze (L4)

PO1 Verb: Analyze (L4)

CO5 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

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Year : I **Semester : II** **Branch of Study : Common to all**

Subject Code:23ABS9905	Subject Name: Differential Equations and Vector Calculus	L	T /CLC	P	Credits
		4	2	0	3

Course Outcomes (CO): Student will be able to

1. Apply the concepts of ordinary differential equations of first order and first degree.
2. Apply the methods of linear differential equations related to various engineering problems.
3. Analyze the solutions of partial differential equations using Lagrange's method.
4. Understand the different operators and identities in the vector calculus.
5. Evaluate the surface integral and volume integral in the vector calculus using various theorems.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	**Apply**	The concepts of ordinary differential equations.		of first order and first degree	**L3**
2	**Apply**	The methods of linear differential equations related to various engineering problems.			**L3**
3	**Analyze**	The solutions of partial differential equations.	Using Lagrange's method		**L4**
4	**Understand**	different operators and identities in the vector calculus.			**L2**
5	**Evaluate**	the surface integral and volume integral in the vector calculus.	Using various theorems		**L5**

UNIT I: Linear Differential Equations of first Order and first Degree **9hrs**

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

UNIT II: Equations Reducible to Linear Differential Equations and Applications **9 hrs**

Definitions, homogeneous and non-homogeneous , 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 **9 hrs**

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 **9 hrs**

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 **9 hrs**

Line integral-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 applications of these theorems.

Text Books :

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.

References:

1. Dr.T.K.V.Iyengar, Engineering Mathematics-I,S.Chand publishers
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics,Laxmipublication,2008
4. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education.

Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3												
2	3												
3		3											
4	2												
5		3											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	correlation	Verb	BTL			
1	**14**	20.8	3	**Apply**	**L4**	PO1	**Apply**	3
2	**15**	22.3	3	**Apply**	**L3**	PO1	**Apply**	3
3	**14**	20.8	**3**	**Analyze**	**L4**	PO2	**Analyze**	3
4	**9**	13.4	**2**	**Understand**	**L2**	PO1	**Apply**	2
5	**15**	22.3	**3**	**Evaluate**	**L5**	PO2	**Analyze**	3

CO1: Apply the concepts of ordinary differential equations of first order and first degree.
Action Verb: Apply(L3)
PO1Verbs: Apply(L3)
CO1 Action Verb is equal to PO1 verb Therefore correlation is high (3).

CO2: Apply the methods of linear differential equations related to various engineering problems.
Action Verb: Apply (L3)
PO1 Verbs: Apply (L3)
CO2 Action Verb is equal to PO1 verb; Therefore correlation is high (3).

CO3: Analyze the solutions of partial differential equations.
Action Verb: Analyze(L4)
PO2 Verb: Analyze (L4)
CO3 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

CO4: Understand the different operators and identities in the vector calculus.
Action Verb: Understand(L2)
PO1 Verb: Apply(L3)
CO4 Action Verb is low level to PO1 to one level; Therefore correlation is moderate(2).

CO5: Evaluate the surface integral and volume integral in the vector calculus.
Action Verb: Evaluate(L5)
PO2 Verb: Analyze (L4)
CO5 Action verb is high level to PO2 verb; therefore the correlation is high (3).

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AK23 Regulations

I YEAR **II SEMESTER**

Subject Code	Subject Name	L	T	P	CREDITS
23AES0101	BASICS OF CIVIL & MECHANICAL ENGINEERING	3	0	0	3

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society
CO2: Apply the methods of surveying in finding the measurements on Earth surface
CO3: Understand the importance of transportation, water resources and environmental engineering
CO4: Understand the applications and role of various materials in Mechanical Engineering.
CO5: Understand the different manufacturing processes and the basics of thermal engineering with its applications.
CO6: Understand the working of different mechanical power transmission systems, power plants and applications of robotics.

Course Outcomes

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Understand	Various sub-divisions of Civil Engineering		Role in ensuring better society	L2
CO2	Apply	Methods of surveying	Finding the measurements	On Earth surface	L3
CO3	Understand	Importance of transportation, water resources and environmental engineering			L2
CO4	Understand	applications and role of various materials in Mechanical Engineering			L2
CO5	Understand	different manufacturing processes and the basics of thermal engineering with its applications			L2
CO6	Understand	working of different mechanical power transmission systems, power plants and applications of robotics			L2

BASICS OF CIVIL ENGINEERING (PART-A)

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 andConveyance 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. FifthEdition
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, KhannaPublishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, KhannaPublishers, 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

BASICS OF MECHANICAL ENGINEERING (PART-B)

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.

Textbooks:

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

Reference Books:

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

Course Title	COs	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
BASICS OF CIVIL & MECHANICAL ENGINEERING	CO1	2	2				2							
	CO2	3	2				2							
	CO3	2	2				2							
	CO4	2					2							
	CO5	2					2							
	CO6	2				2	2							

CO	CO					Program Outcomes (PO)	PO(s): Action Verb and BTL (for PO1 to PO5)	Level of Correlation
	Lesson Plan (Hrs)	%	Correlation	Verb	BTL			
1	11/33	33	2	Understand	L2	PO1 PO2 PO6	Apply (L3) Analyze (L3) Thumb Rule	2 2 2
2	12/33	34	3	Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
3	11/33	33	2	Understand	L2	PO1 PO2 PO6	Apply (L3) Analyze (L3) Thumb Rule	2 2 2
4	9/30	30	3	Understand	L2	PO1 PO6	Identify-L3 Thumb Rule	2 2
5	12/30	40	3	Understand	L2	PO1 PO6	Identify-L3 Thumb Rule	2 2
6	9/30	30	3	Understand	L2	PO1 PO5 PO6	Apply(Identify)-L3 Apply-L3 Thumb Rule	2 2 2

Justification Statements:

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

Action Verb: Understand (L2)

PO1 Verb: **Apply (L3)**

CO1 Action verb is not same level as PO1 verb. Therefore, the correlation is medium (2)

PO2 Verb: **Analyze(L4)**

CO1 Action verb is not same level as PO2 verb. Therefore, the correlation is medium (2)

PO6 Verb: **Thumb Rule**

CO1 correlates medium with PO6. Therefore, the correlation is medium (2)

CO2: Apply the methods of surveying in finding the measurements on Earth surface.

Action Verb: **Apply (L3)**

PO1 Verb: **Apply (L3)**

CO2 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze(L4)**

CO2 Action verb is not same level as PO2 verb. Therefore, the correlation is medium (2)

PO6 Verb: **Thumb Rule**

CO2 correlates medium with PO6. Therefore, the correlation is medium (2)

CO3: Understand the importance of transportation, water resources and environmental engineering.

Action Verb: Understand (L2)

PO1 Verb: **Apply (L3)**

CO3 Action verb is not same level as PO1 verb. Therefore, the correlation is medium (2)

PO2 Verb: **Analyze(L4)**

CO3 Action verb is not same level as PO2 verb. Therefore, the correlation is medium (2)

PO6 Verb: **Thumb Rule**

CO3 correlates medium with PO6. Therefore, the correlation is medium (2)

CO4: Understand the applications and role of various materials in Mechanical Engineering.

Action Verb: **Understand (L2)**

PO1 Verb: **Apply (L3)**

CO4 Action verb is less than PO1 verb by one level. Therefore, the correlation is medium (2)

PO3 Verb: **Review-L2**

CO4 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO6 Verb: **Thumb Rule**

CO4 correlates moderately with PO6. Therefore, the correlation is medium (2).

CO5: Understand the different manufacturing processes and the basics of thermal engineering with its applications.

Action Verb: **Understand (L2)**

PO1 Verb: **Apply (L3)**

CO5 Action verb is less than PO1 verb by one level. Therefore, the correlation is medium (2)

PO3 Verb: **Review-L2**

CO5 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO6 Verb: **Thumb Rule**

CO5 correlates moderately with PO6. Therefore, the correlation is medium (2).

CO6: Understand the working of different mechanical power transmission systems, power plants and applications of robotics.

Action Verb: **Understand (L2)**

PO1 Verb: **Apply (L3)**

CO5 Action verb is less than PO1 verb by one level. Therefore, the correlation is medium (2)

PO3 Verb: **Review-L2**

CO5 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO6 Verb: **Thumb Rule**

CO5 correlates moderately with PO6. Therefore, the correlation is medium (2).

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Course Name: NETWORK ANALYSIS
Course Code: 23APC0203
I B. Tech II Sem

COURSE OUTCOMES:

CO1: Understand the basic electrical circuits and simplification using nodal & mesh analysis related theorems.
CO2: Analyze the transient response of R-L, R-C, and R-L-C.
CO3: Understand the Steady state analysis & A. C circuits with R-L, R-C, and R-L-C.
CO4: Analyze the series and parallel resonance circuits and coupled circuits.
CO5: Analyze the parameters of a two-port network.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Bloom's level
1	Understand	The Basic electrical circuits and simplification using nodal & mesh analysis related theorems.	nodal & mesh analysis related theorems		L2
2	Analyze	Transient response of A. C & D. C circuits.	circuits with R-L, R-C, and R-L-C components		L4
3	Understand	Steady state analysis A. C circuits with R-L, R-C, and R-L-C components.	circuits with R-L, R-C, and R-L-C components		L2
4	Analyze	The series and parallel resonance circuits and coupled circuits.			L4
5	Analyze	The parameters of a two-port network.			L4

SYLLABUS:

UNIT I: Basics of Electrical circuits

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal 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-homogeneous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots.

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.

Mapping of course outcomes with program outcomes

Course Title	COs	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)												
		PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2
NETWORK ANALYSIS	CO1	2	2				1						3	
	CO2	3	3				1						3	
	CO3	2	1				1						3	
	CO4	3	3	1			1						3	
	CO5	3	3				1						3	

Justification Table:

CO	CO					Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	corr	Verb	BTL			
1				Understand	L2	PO1, PO2, PO6	PO1: Apply (L3) PO2: Identify (L3) PO6: Thumb Rule	2 2 1
2				Analyze	L4	PO1, PO2, PO6	PO1: Apply (L3) PO2: Analyze(L4) PO6: Thumb Rule	3 3 1
3				Understand	L2	PO1, PO2, PO6	PO1: Apply (L3) PO2: Analyze(L4) PO6: Thumb Rule	2 1 1
4				Analyze	L4	PO1, PO2, PO3, PO6	PO1: Apply (L3) PO2: Analyze(L4) PO3: Design (L6) PO6: Thumb Rule	3 3 1 1
5				Analyze	L4	PO1, PO2, PO6	PO1: Apply (L3) PO2: Analyze(L4) PO6: Thumb Rule	3 3 1

CO1: Understand the basic electrical circuits and simplification using nodal & mesh analysis related theorems.

Action Verb: Understand (L2)

PO1: Apply (L3)

CO1 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).

PO2: Identify (L3)

CO1 Action Verb is Less than PO2 verb by one level; Therefore, correlation is moderate (2).

PO6: Using thumb rule, CO1 correlates to PO6 as Low (1).

CO2: Analyze the transient response of R-L, R-C, and R-L-C.

Action Verb: Analyze (L4)

PO1: Apply (L3)

CO2 Action Verb is Greater than PO1 verb by one level; Therefore, correlation is high (3).

PO2: Analyze (L4)

CO2 Action Verb is same as PO2 verb; Therefore, correlation is high (3).

PO6: Using thumb rule, CO2 correlates to PO6 as Low (1).

CO3: Understand the Steady state analysis & A. C circuits with R-L, R-C, and R-L-C.

Action Verb: Understand (L2)

PO1: Apply (L3)

CO3 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).

PO2: Analyze (L4)

CO3 Action Verb is Less than PO2 verb by two level; Therefore, correlation is low (1).

PO6: Using thumb rule, CO3 correlates to PO6 as Low (1).

CO4: Analyze the series and parallel resonance circuits and coupled circuits.

Action Verb: Analyze (L4)

PO1: Apply (L3)

CO4 Action Verb is Greater than PO1 verb by one level; Therefore, correlation is high (3).

PO2: Analyze (L4)

CO4 Action Verb is same as PO2 verb; Therefore, correlation is high (3).

PO3: Design (L6)

CO4 Action Verb is Less than PO3 verb by two level; Therefore, correlation is low (1)

PO6: Using thumb rule, CO4 correlates to PO6 as Low (1).

CO5: Analyze the parameters of a two-port network.

Action Verb: Analyze (L4)

PO1: Apply (L3)

CO5 Action Verb is Greater than PO1 verb one level; Therefore, correlation is high (3).

PO2: Analyze (L4)

CO5 Action Verb is same as PO2 verb; Therefore, correlation is high (3).

PO6: Using thumb rule, CO5correlates to PO6 as Low (1)

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(Effective for the batches admitted from 2023-24)

Year: I B.Tech **(Common to all branches)** **Semester: II**

Subject Code 23AHM9902	Subject Name COMMUNICATIVE ENGLISH LAB	L T P 0 0 2	Credit 1

Course Outcomes (CO): Student will be able to

CO1:Understand-the different aspects of the English language proficiency with emphasis on LSRW skills.

CO2: Apply communication skills through various language learning activities.

CO3: Analyze the English speech sounds, for better listening and speaking.

CO4: Evaluateandexhibitprofessionalisminparticipatingindebatesandgroupdiscussions.

CO5:Analyze themselves to face interviews in future.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	**Understand**	**the different aspects of the English language proficiency with emphasis on LSRW skills**			**L2**
2	**Apply**	**communication skills through various language learning activities**			**L3**
3	**Analyze**	**the English speech sounds, for better listening and speaking.**			**L4**
4	**Evaluate**	**and exhibit professionalism in participating in debates and group discussions**			**L5**
5	**Analyze**	**themselves to face interviews in future**			**L4**

List of Topics:

1. Vowels & Consonants (CO3)
2. Non Verbal Communication (CO2)
3. Communication Skills(CO2)
4. Role Play or Conversational Practice (CO1,CO2)
5. E-mail Writing (CO1)
6. Just A Minute (CO1,CO2)
7. Group Discussions – methods & practice (CO4)
8. Debates –Methods & Practice (CO4)
9. PPT Presentations/Poster Presentation (CO2)
10. Interviews Skills (CO5)

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. RamanMeenakshi,Sangeeta-Sharma.*TechnicalCommunication*.OxfordPress.2018.
2. TaylorGrant:*EnglishConversationPractice*,TataMcGraw-HillEducationIndia,2016

3. Hewing's, Martin. Cambridge *Academic English*(B2).CUP,2012.
4. J. Sethi &P.V. Dhamija. *A Course in Phonetics and Spoken English*,(2nd Ed),Kindle,2013.

WebResources:

SpokenEnglish:

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

Mapping of COs to POs and PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1									2				
2								2	2				
3									3				
4								3	3				
5									3				

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	corr	Verb	BTL			
1				**Understand**	**L2**	9	Thumb Rule	2
2				**Apply**	**L3**	8,9	Thumb Rule	2,2
3				**Analyze**	**L4**	9	Thumb Rule	3
4				**Evaluate**	**L5**	8,9	Thumb Rule	3,3
5				**Analyze**	**L4**	9	Thumb Rule	3

CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills
Action Verb: Understand (L2)

CO1 Action Verb is understand of BTL 2. Using Thumb rule, L2 correlates PO6 to PO11 as moderate (2).

CO2: Apply communication skills through various language learning activities.
Action Verb: Apply (L3)
CO2 Action Verb is Apply of BTL 3. Using Thumb rule, L3 correlates PO6 to PO11 as moderate(2).

CO3: Analyze the English speech sounds, for better listening and speaking.
Action Verb: Analyze (L4)
CO3 Action Verb is Analyze of BTL 4. Using Thumb rule, L4 correlates PO6 to PO11 as high (3).

CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.
Action Verb: Evaluate (L5)

CO4 Action Verb is Evaluate of BTL 5. Using Thumb rule, L5 correlates PO6 to PO11 as high (3).

CO5: Analyze themselves to face interviews in future.
Action Verb: Develop (L4)

CO5 Action Verb is Analyze of BTL 4. Using Thumb rule, L4 correlates PO6 to PO11 as high (3).

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(Effective for the batches admitted from 2023-24)

Year: I B.Tech (Common to EEE, ECE, CSE & allied branches) Semester: II

Subject Code: 23ABS9906	Subject Name: Chemistry Lab	L	T	P	Credits:1
		0	0	2	

Course Objectives: Students are expected to Verify the fundamental concepts with experiments.

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

CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Analyze the UV-Visible spectra of some organic compounds.
CO5: Estimate the unknown solution by volumetric analysis

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	**Determine**	Cell constant and conductance of solutions**.**			**L4**
2	**Prepare**	advanced polymer Bakelite materials			**L4**
3	**Measure**	Strength of an acid present in secondary batteries**.**			**L4**
4	**Analyze**	UV-Visible spectra of some organic compounds**.**			**L4**
5	**Estimate**	Unknown solution by volumetric analysis.			**L5**

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. Estimation of copper by Iodometry.
10. Wavelength measurement of sample through UV-Visible Spectroscopy.
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

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

Reference:

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

Mapping of COs to POs and PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1				3									
2				3									
3				3									
4				3									
5				3									

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	correlation	Verb	BTL			
1				Determine	L4	PO4	PO4: Analyze (L4)	3
2				Prepare	L4	PO4	PO4: Analyze (L4)	3
3				Measure	L4	PO4	PO4: Analyze (L4)	3
4				Analyze	L4	PO4	PO4: Analyze (L4)	3
5				Estimate	L5	PO4	PO4: Analyze (L5)	3

CO1: Determine the cell constant and conductance of solutions**.**

Action Verb: Determine **(L4)**

PO4 Verb: Analyze (L4)

CO1 Action Verb is equal to PO4 verb; Therefore, correlation is high (3).

CO2: Prepare advanced polymer Bakelite materials**.**

Action Verb: Prepare **(L4)**

PO4 Verb: Analyze (L4)

CO2 Action Verb is equal to PO4 verb; Therefore, correlation is high (3).

CO3: Measure the strength of an acid present in secondary batteries**.**

Action Verb: Measure **(L4)**

PO4 Verb: Analyze (L4)

CO3 Action Verb is equal to PO4 verb; Therefore, correlation is high (3)

CO4: Analyze the UV-Visible spectra of some organic compounds.

Action Verb: Analyze **(L4)**

PO4 Verb: Analyze (L4)

CO4 Action Verb is equal to PO4 verb; Therefore, correlation is high (3)

CO5: Estimate the unknown solution by volumetric analysis**.**

Action Verb: Estimate **(L5)**

PO4 Verb: Analyze (L4)

CO5 Action Verb is greater than PO4; Therefore correlation is high (3).

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Year: I **Semester: II** **Branch of Study: Common to all Branches**

Subject Code	Subject Name	L	T	P	Credits
23AES0302	Engineering Workshop	0	0	3	1.5

Course Outcomes:

CO: 1 Apply the wood working skills to prepare different joints.

CO: 2 Analyze the sheet metal and fitting operations to prepare various components

CO: 3 Apply the basic electrical engineering knowledge for house wiring practice.

CO: 4 Apply the Welding process for Lap and Butt Joints.

CO: 5 Understand the various plumbing pipe joints

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Apply	the wood working skills to prepare different joints			L3
CO2	Analyze	the sheet metal and fitting operations to prepare various components			L4
CO3	Apply	the basic electrical engineering knowledge for house wiring practice			L3
CO4	Apply	the Welding process for Lap and Butt joints			L3
CO5	Understand	the various plumbing pipe joints			L2

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 wood working 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 metal working, 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 make the following connections.
   a) Parallel and series b)Two-way switch c)God own 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.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, FelixW.; Independently Published, 2019.Workshop Processes, Practices and Materials; Bruce J.Black, Routledge publishers,5thEdn.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.IbyS. K. Hajr a Choudhury & Others, Media Promoters and Publishers,Mumbai.2007,14th edition
2. Workshop Practice by H.S.Bawa, Tata-McGrawHill, 2004.

Course Title	COs	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
Engineering Workshop	CO1	3	3	3						3			3	3
	CO2	3	3	3						3			3	3
	CO3	3	3	3						3			3	3
	CO4	3	3	3						3			3	3
	CO5	2	2	2						2			3	3

Correlation Matrix

CO	CO					Program Outcomes (PO)	PO(s): Action Verb and BTL (for PO1 to PO5)	Level of Correlation
	Lesson Plan (Hrs)	%	Correlation	Verb	BTL			
1	-	-	3	Apply	L3	PO1 PO2 PO3 PO9	Apply-L3 Review-L2 Develop-L3 Thumb Rule-L3	3 3 3 3
2	-	-	3	Analyze	L4	PO1 PO2 PO3 PO9	Apply-L3 Review-L2 Develop-L3 Thumb Rule-L3	3 3 3 3
3	-	-	1	Apply	L3	PO1 PO2 PO3 PO9	Apply-L3 Review-L2 Develop-L3 Thumb Rule-L3	3 3 3 3
4	-	-	2	Apply	L3	PO1 PO2 PO3 PO9	Apply-L3 Review-L2 Develop-L3 Thumb Rule-L3	3 3 3 3
5	-	-	2	Understand	L2	PO1 PO2 PO3 PO9	Apply-L3 Review-L2 Develop-L3 Thumb Rule-L3	2 2 2 2

Justification Statements:

CO1: Apply the wood working skills to prepare different joints

Action Verb: **Apply**(L3)

PO1 Verb: **Apply** (L3)

CO1 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Review (L2)**
CO1 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO3Verb: **Develop (L3)**
CO1 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)
PO9 Verb: **Thumb Rule**
CO1 Action verb is same level as PO9 verb. Therefore, the correlation is high (3)

CO2: Analyze the sheet metal and fitting operations to prepare various components

Action Verb: **Analyse** (L4)

PO1 Verb: **Apply** (L3)

CO2 Action verb is same level (greater) as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Review (L2)**
CO2 Action verb is same level (greater) as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop (L3)**
CO2 Action verb is same level (greater) as PO3 verb. Therefore, the correlation is high (3)
PO9 Verb: **Thumb Rule**
CO2 Action verb is same level (greater) as PO9 verb. Therefore, the correlation is high(3)

CO3: Apply the basic electrical engineering knowledge for house wiring practice

Action Verb: **Apply**(L3)

PO1 Verb: **Apply** (L3)

CO3 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Review (L2)**
CO3 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop (L3)**
CO3 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)
PO9 Verb: **Thumb Rule**
CO3 Action verb is same level as PO9 verb. Therefore, the correlation is high (3)

CO4: Apply the Welding process for Lap and Butt Joints

Action Verb: **Apply**(L3)

PO1 Verb: **Apply** (L3)

CO4 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO2 Verb: **Review (L2)**
CO4 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop(L3)**
CO4 Action verb is same level as PO3 verb. Therefore, the correlation is high(3)
PO9 Verb: **Thumb Rule**
CO4 Action verb is same level as PO9 verb. Therefore, the correlation is high(3)

CO5: Understand the various plumbing pipe joints.

Action Verb: **Understand (L2)**
PO1 Verb: **Apply** (L2)

CO5 Action verb is less than as PO1 verb. Therefore, the correlation is high (2)
PO2 Verb: **Review (L2)**
CO5 Action verb is less than as PO2 verb. Therefore, the correlation is high (2)

PO3 Verb: **Develop (L3)**
CO5 Action verb is less than as PO3 verb. Therefore, the correlation is high (2)
PO9 Verb: **Thumb Rule**
CO5 Action verb is less than as PO9 verb. Therefore, the correlation is high (2)

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AK23 Regulations

Course Name: NETWORK ANALYSIS AND SIMULATION LABORATORY

Subject Code: 23APC0204 **I B. Tech II Sem**

L	T	P	Credits
0	0	3	1.5

COURSE OUTCOMES:

CO1: Understand the Kirchhoff's laws and network theorems.
CO2: Analyze the time constants of RL & RC circuits.
CO3: Analyze the behaviour of RLC circuit for different cases.
CO4: Design the resonant circuit for the given specifications.
CO5: Analyze the network in terms of all network parameters.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Bloom's level
1	Understand	Kirchhoff's laws and network theorems.			L2
2	Analyze	Time constants of RL & RC circuits.			L4
3	Analyze	The behaviour of RLC circuit for different cases.			L4
4	Design	Resonant circuit for the given specifications.			L6
5	Analyze	The network in terms of all network parameters.			L4

SYLLABUS:

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-(CO1).
2. Verification of mesh and nodal analysis for AC circuits-(CO1).
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits-(CO1).
4. Verification of maximum power transfer theorem for AC circuits-(CO1).
5. Verification of Tellegen's theorem for two networks of the same topology-(CO1).
6. Study of DC transients in RL, RC and RLC circuits-(CO2).
7. To study frequency response of various 1st order RL & RC networks-(CO2).
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-(CO3).
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit-(CO4).
10. Determination of open circuit (Z) and short circuit (Y) parameters-(CO5).
11. Determination of hybrid (H) and transmission (ABCD) parameters-(CO5).
12. To measure two port parameters of a twin-T network and study its frequency response-(CO5).

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.

Mapping of course outcomes with program outcomes.

Course Title	COs	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
NETWORK ANALYSIS AND SIMULATION LABORATORY	CO1	2	1		1					1			3	
	CO2	3	3		3					1			3	
	CO3	3	3		1					1			3	
	CO4		3		3					1			3	
	CO5	3	3		1					1			3	

Justification Table:

CO	COs		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Verb	BTL			
1	Understand	L2	PO1, PO2, PO4, PO9	PO1: Apply (L3) PO2: Analyze (L4) PO4: Analyze (L4) PO9: Thumb Rule	2 1 1 1
2	Analyze	L4	PO1, PO2, PO4, PO9	PO1: Apply (L3) PO2: Analyze(L4) PO4: Analyze(L4) PO9: Thumb Rule	3 3 3 1
3	Analyze	L4	PO1, PO2, PO4, PO9	PO1: Apply (L3) PO2: Analyze(L4) PO4: Design (L6) PO9: Thumb Rule	3 3 1 1
4	Design	L6	PO2, PO4, PO9	PO2: Analyze(L4) PO4: Design (L6) PO9: Thumb Rule	3 3 1
5	Analyze	L4	PO1, PO2, PO4, PO9	PO1: Apply (L3) PO2: Analyze(L4) PO4: Design (L6) PO9: Thumb Rule	3 3 1 1

CO1: Understand the Kirchhoff's laws and network theorems.
Action Verb: Understand (L2)
PO1: Apply (L3)
CO1 Action Verb is Less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO1 Action Verb is Less than PO2 verb by two level; Therefore, correlation is low (1).
PO4: Analyze (L4)
CO1 Action Verb is Less than PO4 verb by two level; Therefore, correlation is low (1).
PO9: Using Thumb Rule, CO1 correlates to PO6 as Low (1).

CO2: Analyze the time constants of RL & RC circuits.
Action Verb: Analyze (L4)
PO1: Apply (L3)
CO2 Action Verb is Greater than PO1 verb by one level; Therefore, correlation is high (3).
PO2: Analyze (L4)
CO2 Action Verb is same as PO2 verb; Therefore, correlation is high (3).
PO4: Analyze (L4)

CO2 Action Verb is same as PO4 verb; Therefore, correlation is high (3).
PO9: Using Thumb Rule, CO2 correlates to PO6 as Low (1).

CO3: Analyze the behaviour of RLC circuit for different cases.
Action Verb: Analyze (L4)
PO1: Apply (L3)
CO2 Action Verb is Greater than PO1 verb by one level; Therefore, correlation is high (3).
PO2: Analyze (L4)
CO3 Action Verb is same as PO2 verb; Therefore, correlation is high (3).
PO4: Design (L6)
CO3 Action Verb is Less than PO4 verb by two level; Therefore, correlation is low (1).
PO9: Using Thumb Rule, 3 correlates to PO6 as Low (1).

CO4: Design the resonant circuit for the given specifications.
Action Verb: Create (L6)
PO2: Analyze (L4)
CO4 Action Verb is greater than PO2 verb by two level; Therefore, correlation is high (3).
PO4: Design (L6)
CO4 Action Verb is same as PO4 verb; Therefore, correlation is high (3).
PO9: Using Thumb Rule, CO4 correlates to PO6 as Low (1).

CO5: Analyze the network in terms of all network parameters.
Action Verb: Analyze (L4)
PO1: Apply (L3)
CO5 Action Verb is Greater than PO1 verb by one level; Therefore, correlation is high (3).
PO2: Analyze (L4)
CO5 Action Verb is same as PO2 verb; Therefore, correlation is high (3).
PO4: Design (L6)
CO5 Action Verb is Less than PO4 verb by two level; Therefore, correlation is low (1).
PO9: Using Thumb Rule, CO5 correlates to PO6 as Low (1).

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I B. TECH **Common to II SEM ECE/AI&DS/AI&ML/CE/ME**

Course Code: 23AHM9903	HEALTH AND WELLNESS, YOGA AND SPORTS	L T P C 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: After completion of the course the student will be able to

1. Understand the health & fitness by diet
2. Understand the importance of yoga.
3. Apply The yoga practices including Surya Namaskar
4. Understand the importance of sports.
5. Analyze various activities that help enhance their health & Positive Personality

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	**Understand**	Health & fitness by diet			**L2**
2	**Understand**	Importance of yoga.			**L2**
3	**Apply**	yoga practices including Surya Namaskar			**L3**
4	**Understand**	Importance of sports			**L2**
5	**Analyze**	Various activities that help enhance their health & Positive Personality			**L4**

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:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) 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:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
Practicing general and specific warm up, aerobics
ii) 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 SurvivingAnywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, 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, totalingto 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva in the subject

Mapping of COs to POs and PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1						2	2						
2						2	2						
3						2	2						
4						2	2						
5						3	3						

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours				CO		Program Outcome (PO)	Level of Correlation (0-3)
	Register (Hrs)	Lesson Plan (Hrs)	%	corr	Verb	BTL		
1					Understand	L2	P06,P07	2
2					Understand	L2	P06,P07	2
3					Apply	L3	P06,P07	2
4					Understand	L2	P06,P07	2
5					Analyze	L4	P06,P07	3

CO1: Understand the health & fitness by diet
Action Verb: Understand (L2)
CO1 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

CO2: Understand the Importance of yoga
Action Verb: Understand (L2)
CO2 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

CO3: APPLY
yoga practices including Surya Namaskar
Action Verb: APPLY (L3)
CO3 Action Verb is APPLY of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

CO4: .Understand Importance of sports
Action Verb: Understand (L2)
CO4 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

Action Verb: APPLY (L3)

CO5: Analyze the Various activities that help enhance their health & Positive Personality
Action Verb: Analyze (L4)
CO5 Action Verb is Analyze of BTL 2.Using Thumb rule; L4 correlates PO6 and PO7 as a moderate (2)

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AK23-REGULATIONS
B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech.–II Year I Semester

S. No.	Category	Course code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T/CLC	P	C			
1	BS	23ABS9912	Probability and Complex Variables	4	2	0	3	30	70	100
2	HM	23AHM9905	Universal Human Values	4	2	0	3	30	70	100
3	ES	23AES0401	Signals, Systems and Stochastic Processes	3	2	0	3	30	70	100
4	PC	23APC0401	Electronic Devices and Circuits	3	1	0	3	30	70	100
5	PC	23APC0402	Digital Circuit Design	3	1	0	3	30	70	100
6	PC	23APC0403	Electronic Devices and Circuits Lab	0	0	3	1.5	30	70	100
7	PC	23APC0404	Digital Circuits and Signal Simulation Lab	0	0	3	1.5	30	70	100
8	SC	23ASC0501	Python Programming	0	1	2	2	30	70	100
Total				17	9	8	20	240	560	800

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B.Tech Year: II **Semester: I** **Branch of Study: ECE**

Subject Code	Subject Name:	L	T /CLC	P	Credits
23ABS9912	Probability and Complex Variables	4	2	0	3

Course Outcomes (CO): Student will be able to

1) Apply the probability theory and various distributions to calculate their statistical constants.
2) Understand the concept of multiple random variables and joint distribution.
3) Apply the operations on multiple random variables.
4) Apply the differentiation for complex variable functions.
5) Evaluate the integrals and power series expansions for complex variable functions.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Apply	the probability theory and various distributions	to calculate their statistical constants		L3
2	Understand	the concept of multiple random variables and joint distribution			L2
3	Apply	the operations	on multiple random variables		L3
4	Apply	the differentiation	For complex variable functions		L3
5	Evaluate	the integrals and power series expansions	for complex variable functions		L5

UNIT-I : Probability & Random Variables **9 hrs**

Probability through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Independent Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem.

Random variables (discrete and continuous), probability density functions, properties, mathematical expectation, Distribution and Density functions: Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh-their properties.

UNIT-II: Operations on Random variables **9 Hrs**

Moments-moments about the origin, Central moments, Variance and Skew, Cheby shev's inequality, moment generating function, characteristic function.

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

UNIT-III: Operations on Multiple Random variables **9 Hrs**

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables.

UNIT-IV: Complex Variable – Differentiation **10hrs**

Introduction to functions of complex variable-concept of Limit , continuity & Differentiation, Cauchy-Riemann equations(Cartesian and polar coordinates), analytic functions, harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.

UNIT-V: Complex Variable – Integration **10hrs**

Line integral-Contour integration, Cauchy's integral theorem (Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of integrals of the type.

(a) $\int_0^{2\pi} F(cos\theta, sin\theta)\, d\theta$ (b) $\int_{-\infty}^{\infty} e^{imx}\, dx$

Textbooks:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers,2017, 44th Edition
3. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012

Reference Books:

1. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India
3. B.V.Ramana, Higher Engineering Mathematics, McGrew Hill publishers.
4. Y.Mallikarjuna Reddy, Probability Theory and Stochastic Processes, 4th Edition, Universities Press

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma66/preview#:~:text=This%20course%20provides%20random%20variable,and%20simple%20Markovian%20queueing%20models.

Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	3												
2	2												
3	3												
4	3												
5		3											

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	correlation	Action Verb	BTL			
1				Apply	**L3**	PO1	**Apply (L3)**	3
2				Understand	**L2**	PO1	**Apply (L3)**	2
3				Apply	**L3**	PO1	**Apply (L3)**	3
4				Apply	**L3**	PO1	**Apply (L3)**	3
5				Evaluate	**L5**	PO2	**Analyze (L4)**	3

CO1: Apply the probability theory and various distributions to calculate their statistical constants: Apply (L3)
PO1 Verb: Apply (L3)

CO1 Action Verb level is equal to PO1 verb; Therefore correlation is high (3).

CO22) Understand the concept of multiple random variables and joint distribution: Understand (L2)
PO1 Verb: Apply (L3)

CO2 Action Verb is less than to PO1 verb by one level; Therefore correlation is moderate (2).

CO3: Apply the operations on multiple random variables: Apply (L3)
PO1 Verb: Apply (L3)

CO3 Action Verb level is equal to PO1 verb; Therefore correlation is high (3).

CO4: Apply the differentiation for complex variable functions: Apply (L3)
PO1 Verb: Apply (L3)
CO4 Action Verb level is equal to PO1 verb; Therefore correlation is high (3).

CO5: Evaluate the integrals and power series expansions for complex variable functions: Evaluate(L5)
PO2 Verb: Analyze (L4)

CO5 Action Verb level is high to PO2 verb; Therefore correlation is high (3).

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Year: II B.Tech **Common to all branches** **Semester: I**

Subject Code 23AHM9905	Subject Name UNIVERSAL HUMAN VALUES	L 4	T/CLC 2	P 0	Credit: 3

Pre-Requisites		Semester	I & II

Course Outcomes (CO): Student will be able to

CO1. Understand the essentials of human values, self-exploration, happiness and prosperity for value added education.

CO2. Analyze the harmony in the human being as sentient 'I' and the material 'Body' in various aspects.

CO3. Apply the nine universal human values in relationships for harmony in the family and orderliness in the society.

CO4. Evaluate the interconnectedness of four orders of nature and holistic perception of harmony at all levels of existence.

CO5. Apply the holistic understanding of harmony on professional ethics through augmenting universal human order.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Understand	The essentials of human values, self-exploration, happiness and prosperity for value added education.			L2
2	Analyze	the harmony in the human being as sentient 'I' and the material 'Body' in various aspects.			L4
3	Apply	the nine universal human values in relationships for harmony in the family and orderliness in the society.			L3
4	Evaluate	The interconnectedness of four orders of nature and holistic perception of harmony at all levels of existence.			L5
5	Apply	The holistic understanding of harmony on professional ethics through augmenting universal human order.			L3

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 fulfill 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 Fulfillment 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

Textbook and Teachers Manual

a. The Textbook
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
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. JeevanVidya: EkParichaya,ANagaraj, JeevanVidyaPrakashan, 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 – PanditSunderlal
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)

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

Correlation of COs with the POs & PSOs for B.Tech
AK-23 Regulations
***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Articulation matrix

Course Title	COs	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)												
		PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO1 0	PO1 1	PSO 1	PSO2
UNIVERSAL HUMAN VALUES – UNDERSTANDING	CO1								2			2		
	CO2							3	3					
	CO3						2	2	2					
	CO4						3	3	3			3		
	CO5						2	2	2			2		

CO-PO mapping justification:
Correlation matrix

CO	CO					Program Outcomes (PO)	PO(s): Action Verb and BTL (for PO1 to PO5)	Level of Correlation
	Lesson Plan (Hrs)	%	Correlation	Verb	BTL			
1	7	19.4	2	Understand	2	PO8,PO11	Thumb Rule	2,2
2	8	22.2	3	Analyze	4	PO7,PO8	Thumb Rule	3,3
3	7	19.4	2	Apply	3	PO6,PO7,PO8	Thumb Rule	2,2,2
4	8	22.2	3	Evaluate	5	PO6,PO7,PO8,PO11	Thumb Rule	3,3,3,3

5	**7**	19.4	**2**	**Apply**	**3**	PO6,PO7,PO8,PO11	Thumb Rule	2,2,2,2

Justification Statements:

CO1: Understand the essentials of human values, self-exploration, happiness and prosperity for value added education.
Action Verb: Understand (L2)
CO1 Action Verb is Understand of BTL 2. Using Thumb rule, L2 correlates PO6 to PO11 as moderate (2).
CO2: Analyze the harmony in the human being as sentient 'I' and the material 'Body' in various aspects.
Action Verb: Analyze (L4)
CO2 Action Verb is Analyze of BTL 4. Using Thumb rule, L4 correlates PO6 to PO11 as high (3).
CO3: Apply the nine universal human values in relationships for harmony in the family and orderliness in the society.
Action Verb: Apply (L3)
CO3 Action Verb is Apply of BTL 3. Using Thumb rule, L3 correlates PO6 to PO11 as moderate (2)
CO4: Evaluate the interconnectedness of four orders of nature and holistic perception of harmony at all levels of existence.
Action Verb: Evaluate (L5)
CO4 Action Verb is Evaluate of BTL5. Using Thumb rule, L5 correlates PO6 to PO11 as high (3).
CO5: Apply the holistic understanding of harmony on professional ethics through augmenting universal human order.
Action Verb: Apply (L3)
CO5 Action Verb is Apply of BTL 3. Using Thumb rule, L3 correlates PO6 to PO11 as moderate (2).

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AK23 Regulations

Course Code	Year & Sem		L	T/CLC	P	C
23AES0401	II-I	SIGNALS, SYSTEMS AND STOCHASTIC PROCESSES	3	2	0	3

Course Outcomes: After studying the course, Student will be able to:

CO1: **Understand** the representation of continuous time and discrete time signals
CO2: **Apply** sampling theorem to convert continuous time signals to discrete time signals, different transform techniques to solve signals and system related problems.
CO3: **Analyze** the properties of systems and characteristics of LTI systems
CO4: **Understand** the Temporal Characteristics of Random Process.
CO5: **Analyze** the Spectral Characteristics of Random Process.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	the representation of continuous time and discrete time signals			L2
CO2	Apply	sampling theorem to convert continuous time signals to discrete time signals	Different transform techniques to solve signals and system related problems.		L3
CO3	Analyze	the properties of systems and characteristics of LTI systems			L4
CO4	Understand	the Temporal Characteristics of Random Process.			L2
CO5	Analyze	the Spectral Characteristics of Random Process.			L4

UNIT I

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals- Orthogonality, mean square error,
Fourier series: Trigonometric Fourier series, Wave symmetry, Even or Odd Symmetry, Exponential Fourier series and problems on Trigonometric Fourier Series and Exponential Fourier Series.

UNIT II

Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing. Illustrative Problems.
Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the s-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions, Illustrative Problems.

UNIT III

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortionless transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

UNIT IV

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

Process. Random Signal, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT V

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

Textbooks:

Peyton Z.Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
A.V. Oppenheim, A.S. Wills kyand S.H. Nawab, "Signals and Systems", 2ndEdition, PHI, 2009.

Reference Books:

Signals, Systems & Communications -B.P.Lathi,2013, BSP.
Athanasios Papoulis and S.Unni krishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002
Simon Haykin and VanVeen, "Signals & Systems", 2ndEdition,Wiley, 2005.
Matthew Sadiku and Warsame H.Ali, "Signals and Systems A primer with MATLAB", CRC Press, 2016.
HweiHsu, "Schaum's Outline of Signals and Systems", 4thEdition, TMH, 2019.

Mapping of course outcomes with program outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2		1								1	
CO2	3	3		2								1	
CO3	3	3		3								2	
CO4	2	2	2	1	2							1	
CO5	3	3	3	3	3							2	

Correlation matrix

Unit No.	CO					Program Outcome (PO)	PO(s) :Action Verb and BTL(for PO1 to PO11)	Level of Correlation (0-3)
	Lesson plan(Hrs)	%	Correlation	Co's Action verb	BTL			
1				Understand	L2	PO1,PO2, PO4,	PO1: Apply (L3) PO2: Identify(L3) PO4:Analyze(L4)	2 2 1
2				Apply	L3	PO1,PO2, PO4,	PO1: Apply (L3) PO2: Identify(L3) PO4:Analyze(L4)	3 3 2
3				Analyze	L4	PO1,PO2, PO4,	PO1: Apply (L3) PO2: Identify(L3) PO4:Analyze(L4)	3 3 3
4				Understand	L2	PO1,PO2, PO3, PO4, PO5,	PO1: Apply (L3) PO2: Identify(L3) PO3: Develop (L3) PO4:Analyze(L4) PO5:Apply(L3)	2 2 2 1 2
5				Analyze	L4	PO1,PO2, PO3, PO4, PO5,	PO1: Apply (L3) PO2: Identify(L3) PO3: Develop (L3) PO4:Analyze(L4) PO5:Apply(L3)	3 3 3 3 3

Justification Statements:

CO1: Understand the representation of continuous time and discrete time signals

Action Verb: Understand (L2)

PO1 Verbs: Apply (L3)

CO1 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2).

PO2 Verb: Identify (L3)

CO1 Action Verb is equal to PO2 verb by one level; therefore correlation is high (2).

PO4 Verb: Analyze (L4)

CO1 Action Verb is less than PO3 verb by two level; therefore correlation is low (1).

CO2: Apply sampling theorem to convert continuous time signals to discrete time signals, different transform techniques to solve signals and system related problems.

Action Verb: Apply (L3)

PO1 Verbs: Apply (L3)

CO2 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).

PO2 Verbs: Review (L2)

CO2 Action Verb is equal to PO2 verb; Therefore correlation is high (3).

PO4 Verb: Analysis (L4)

CO2 Action Verb level is less than PO4 verb by one level; Therefore correlation is moderate (2).

CO3 Analyze the properties of systems and characteristics of LTI systems

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3)

CO3 Action Verb is greater to PO1 verb; Therefore correlation is high (3).

PO2 Verb: Identify (L3)

CO3 Action Verb level is greater than PO2 verb; Therefore correlation is high (3).

PO4 Verb: Analysis (L4)

CO3 Action Verb level is equal PO4 verb; Therefore correlation is high (3).

CO4: Understand the Temporal Characteristics of Random Process.

Action Verb: Understand (L2)

PO1 Verbs: Apply (L3)

CO4 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2).

PO2 Verbs: Identify (L3)

CO4 Action Verb is lesser than PO2 verb by one level; Therefore correlation is moderate (2).

PO3 Verb: Develop (L3)

CO4 Action Verb is equal to PO3 verb; The by one levels therefore correlation is moderate (2).

PO4 Verb: Analyze (L4)

CO4 Action Verb level is lesser than PO4 verb by two levels; Therefore correlation is low (1).

PO5 Verb: Apply (L3)

CO4 Action Verb level is less than PO5 verb by one level; Therefore correlation is moderate (2).

CO5: Analyze the Spectral Characteristics of Random Process.

Action Verb: Analyze

PO1 Verbs: Apply (L3)

CO5 Action Verb is greater to PO1 verb; Therefore correlation is high (3).

PO2 Verbs: Identify (L3)

CO5 Action Verb is greater than PO2 verb Therefore correlation is high (3).

PO3 Verb: Develop (L3)

CO5 Action Verb is greater than PO3 verb; therefore correlation is high (3).

PO4 Verb: Analyze (L4)

CO5 Action Verb level is equal to PO4 verb; Therefore correlation is high (3).

PO5 Verb: Apply (L3)

CO5 Action Verb level is less than PO5 verb by one level; Therefore correlation is moderate (2)

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AK23 Regulations

ELECTRONICS COMMUNICATION AND ENGINEERING (ECE)

Course Code	Year & Sem		L	T/CLC	P	C
23APC0401	II-I	Electronic Devices and Circuits	3	1	0	3

Course Outcomes: After studying the course, Student will be able to:

CO1 **Understand** the operation of PN junction diode, special electronic devices and rectifiers with & without filters.

CO2 **Analyze** the BJT characteristics in three configurations, biasing methods and thermal stabilization techniques.

CO3 **Evaluate** the transistor amplifier parameters by using small signal hybrid model for three configurations.

CO4 **Understand** the construction, operation and characteristics of JFET, E & D MOSFETs and biasing methods.

CO5 **Analyze** the MOSFET amplifier parameters by using small signal model for three configurations.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	the operation of PN junction diode, special electronic devices and rectifiers	with & without filters		L2
CO2	Analyze	the BJT characteristics in three configurations, biasing methods and thermal stabilization techniques			L4
CO3	Evaluate	the transistor amplifier parameters	by using small signal hybrid model	for three configurations	L5
CO4	Understand	the construction, operation and characteristics of JFET, E & D MOSFETs and biasing methods			L2
CO5	Analyze	the MOSFET amplifier parameters	by using small signal model	for three configurations	L4

UNIT I

PN junction diode: Review, diode current equation, Diode resistance, Transition and Diffusion Capacitance, effect of temperature on PN junction diode, Quantitative analysis of Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics, Clipping and Clamping circuits, Illustrative problems.

Special Diodes: Construction, operation and VI characteristics of Tunnel Diode, Varactor Diode, LED, LCD, Photo Diode, SCR and UJT

UNIT II

Review of Bipolar Junction Transistors, Characteristics, Transistor as an Amplifier and as a Switch, BJT Configurations, Limits of Operation, BJT Specifications.

Biasing and Stabilization: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self-Bias, Bias Stability, Thermal Runaway, Thermal Stability, Illustrative problems.

UNIT III

BJT Small Signal Operation and Models- generalized analysis of transistor amplifier model using h-parameters, Current gain, Input resistance, Voltage gain, Output conductance., separating the Signal and the DC Quantities, The exact hybrid model, The approximate hybrid model Single Stage BJT Amplifiers - Common-Emitter (CE) amplifier without and with emitter resistance, Common-Base (CB) amplifier, Common- Collector (CC) amplifier or Emitter Follower, Problem solving.

UNIT IV

Junction Field Effect Transistor (JFET): Construction, Principle of Operation, Drain and Transfer Characteristics , Comparison of BJT and FET, FET as Voltage Variable Resistor. FET biasi**ng.**

MOS Field Effect Transistors: Introduction, Device Structure and Physical Operation, Enhancement and Depletion MOSFET, Drain and Transfer Characteristics MOSFET Circuits at DC, MOSFET as an Amplifier and as

a Switch. Biasing in MOS Amplifier circuits - biasing by fixing V_{GS} with and without source resistance, biasing using drain to gate feedback resistor, biasing using constant current source, body effect, Problem solving.

UNIT V

MOSFET Small Signal Operation Models– the dc bias, separating the DC analysis and the signal analysis, Small signal equivalent circuit models, the trans-conductance, the T equivalent circuit model, Single stage MOS Amplifiers – common source (CS) amplifier without and with source resistance, common gate (CG) amplifier, source follower, Problem Solving.

Textbooks:

Adel S.Sedraand Kenneth C.Smith, "Microelectronic Circuits–Theory and Applications", 6th Edition, Oxford Press, 2013.
J.Milliman and C Halkias,"Integratedelectronics",2ndEdition,TataMcGrawHill, 1991.

References:

Donald A Neamen, "Electronic Circuits–analysisanddesign",3rd Edition, McGraw Hill (India), 2019.
Behzad Razavi,"Microelectronics",Secondedition,Wiley,2013.
R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series,3rd edition, McGraw-Hill(India), 2010.

Mapping of Course Outcomes with Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3										2	
CO2	3	3	3	3								3	
CO3	3	3	3									3	
CO4	2	2	2	1								2	
CO5	3	3	3	3								3	

Correlation matrix

Unit No.	CO					Program Outcome (PO)	PO(s): Action Verb and BTL (for PO1 to PO11)	Level of Correlation (0-3)
	Lesson Plan (Hrs.)	%	Correlation	Co's Action verb	BTL			
1	15	20	2	Understand	**L2**	PO1, PO2	PO1: Apply (L3) PO2: Review(L2)	2 3
2	17	22	3	Analyze	**L4**	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Identify (L3) PO3: Develop(L3) PO4: Analyze(L4)	3 3 3 3
3	15	20	**2**	Evaluate	**L5**	PO1, PO2, PO3	PO1: Apply(L3) PO2: Identify(L3) PO3: Develop(L3)	3 3 3
4	14	18	**2**	Understand	**L2**	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Identify (L3) PO3: Develop(L3) PO4: Analyze(L4)	2 2 2 1
5	15	20	**2**	Analyze	**L4**	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Identify (L3) PO3: Develop(L3) PO4: Analyze(L4)	3 3 3 3
	73	100 %						

Justification Statements:

CO1: Understand the operation of PN junction diode, special electronic devices and rectifiers with & without filters.

Action Verb: Understand (L2)

PO1 Verbs: Apply (L3)

CO1 Action Verb is less than PO1 verb by one level; Therefore, the correlation is moderate (2).

PO2 Verbs: Review (L2)

CO1 Action Verb is equal to PO2 verb; Therefore, the correlation is high (3).

CO2: Analyze the BJT characteristics in three configurations, biasing methods and thermal stabilization techniques.

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3)

CO2 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).

PO2 Verbs: Identify (L3)

CO2 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).

PO3 Verbs: Develop (L3)

CO2 Action Verb is greater than PO3 verb; Therefore, the correlation is high (3).

PO4 Verbs: Analyze (L4)

CO2 Action Verb is equal to PO4 verb; Therefore, the correlation is high (3).

CO3: Evaluate the transistor amplifier parameters by using small signal hybrid model for three configurations.

Action Verb: Evaluate (L5)

PO1 Verbs: Apply (L3)

CO3 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).

PO2 Verb: Identify (L3)

CO3 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).

PO3 Verb: Develop (L3)

CO3 Action Verb is greater than PO3 verb; Therefore, the correlation is high (3).

CO4: Understand transistor biasing methods and thermal stabilization concepts.

Action Verb: Understand (L2)

PO1 Verbs: Apply (L3)

CO4 Action Verb is less than PO1 verb by one level; Therefore, the correlation is moderate (2).

PO2 Verb: Identify (L3)

CO4 Action Verb is less than PO2 verb by one level; Therefore, the correlation is moderate (2).

PO3 Verb: Develop (L3)

CO4 Action Verb is less than PO3 verb by level; Therefore, the correlation is moderate (2)

PO4 Verb: Analyze (L4)

CO4 Action Verb is less than PO4 verb by two levels; Therefore, the correlation is low (1).

CO5: Analyze the transistor amplifier using h-parameter models for three configurations.

Action Verb: Analyze (L4)

PO1 Verb: Apply (L3)

CO5 Action verb is greater to PO1 verb; Therefore, the correlation is high (3).

PO2 verb: Identify (L3)

CO5 Action verb is greater than PO2 verb; Therefore, the correlation is high (3).

PO3 verb: Develop (L3)

CO5 Action verb is greater than PO3 verb; Therefore, the correlation is high (3).

PO4 verb: Analyze (L4)

CO5 Action verb is equal to PO4 verb; Therefore, the correlation is high (3).

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AK23 Regulations

ELECTRONICS COMMUNICATION AND ENGINEERING (ECE)

Course Code	Year & Sem		L	T/CLC	P	C
23APC0402	II-I	Digital Circuit Design	3	1	0	3

Course Outcomes: After studying the course, Student will be able to:

CO1	**Understand** the logic gates and minimization of Boolean functions using K maps
CO2	**Analyze** the design procedure of combinational logic circuits using logic gates.
CO3	**Apply** the Verilog constructs in HDL for various combinational circuits design.
CO4	**Analyze** the sequential logic circuits design using flip flops and Verilog constructs.
CO5	**Analyze** the Finite State Machines and realization of Programmable Logic Devices.

CO	Action Verb	Knowledge Statement	Condition	Criterion	Level
CO1	**Understand**	The Logic Gates minimisation of Boolean functions	Using K maps		L2
CO2	**Analyze**	the design procedure of combinational logic circuits	Using Logic gates		L4
CO3	**Apply**	The design procedure of combinational logic circuits			L3
CO4	**Analyze**	The design procedure of sequential logic circuits	Using Flipflops and verilog constructs		L4
CO5	**Analyze**	The Finite state machines and realisation of programmable logic devices			L4

UNIT I

Boolean algebra, logic operations, and minimization of Boolean functions
Review of Number Systems and Complements Representation of unsigned and signed integers, Floating Point representation of real numbers, Laws of Boolean Algebra, Theorems of Boolean Algebra, Realization of functions using logic gates, Canonical forms of Boolean Functions, Minimization of Functions using Karnaugh Maps.

UNIT II

Combinational Logic Circuits
Combinational circuits, Design with basic logic gates, design procedure, adders, subtractors, 4-bit binary adder/ subtractor circuit, BCD adder, carry look- a-head adder, binary multiplier, magnitude comparator, Encoders, priority encoders, decoders, multiplexers, de-multiplexers.

UNIT III

Hardware Description Language
Introduction to Verilog - structural specification of logic circuits, behavioral specification of logic circuits, hierarchical Verilog Code, Verilog for combinational circuits - conditional operator, if-else statement, case statement, For loop using Combinational circuits with Verilog constructs in HDL

UNIT IV

Sequential Logic Circuits
Basic architectural distinction between combinational and sequential circuits, Design procedure, latches, flip-flops, truth tables and excitation tables, timing and triggering consideration, conversion of flip- flops, design of counters, ripple counters, synchronous counters, ring counter, Johnson counter, registers, shift registers,

universal shift register. Verilog constructs for sequential circuits, flip-flop with clear capability, using Verilog constructs for registers and counters.

UNIT V

Finite State Machines and Programmable Logic Devices

Types of FSM, capabilities and limitations of FSM, state assignment, realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa reduction of state tables using partition technique, Design of sequence detector. Types of PLD's: PROM, PAL, PLA, basic structure of CPLD and FPGA, advantages of FPGAs.

Textbooks:

1. M. Morris Mano, "Digital Design", 3rdEdition,PHI.(Unit I to IV)
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill (Unit V)

Reference Books:

1. Charles H.Roth, Jr, "Fundamentals of Logic Design", 4thEdition, Jaico Publishers.
2. ZviKohavi and Niraj K.Jha, "Switching and Finite Automata Theory,3rdEdition, Cambridge University Press, 2010.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.
4. D.P.Leach, A.P.Malvino, "Digital Principles and Applications", TMH,7thEdition.

Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3										3	
CO2	3	3	3	3								3	
CO3	3	3	3	3								3	
CO4	3	3	3	3								3	
CO5	3	3	3	3								3	

Correlation Matrix:

CO	CO					Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	corr	Verb	BTL			
1				Understand	L2	PO1, PO2,	PO1: Apply (L3) PO2: Review (L2)	2 3
2				Analyze	L4	PO1, PO2, PO3, PO4,	PO1: Apply (L3) PO2: Identify (L3) PO3: Develop (L3) PO4: Analyze (L4)	3 3 3 3
3				Apply	L3	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Develop (L3) PO4: Interpret(L2)	3 3 3 3
4				Analyze	L4	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Identify(L3) PO3: Develop (L3) PO4: Analyze (L4)	3 3 3 3
5				Analyze	L4	PO1, PO2, PO3	PO1: Apply (L3) PO2: Identify (L3) PO3: Develop (L3) PO4: Analyze (L4)	3 3 3 3

Justification statements

CO 1: Understand the logic gates and minimization of Boolean functions using K maps

Action Verb: Understand (L2)

PO1 Verbs: Apply (L3)

CO1 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2).

PO2 Verbs: Review (L2)

CO1 Action Verb is equal to PO2 verb; Therefore correlation is high (3).

CO2: Analyze the design procedure of combinational logic circuits using logic gates.

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3)

CO2 Action Verb is greater than PO1 verb by one level; Therefore correlation is high (3).

PO2 Verbs: Identify (L3)

CO2 Action Verb is greater than PO2 verb; Therefore correlation is high (3).

PO3 Verbs: Develop (L3)

CO2 Action Verb is greater than PO3 verb; Therefore correlation is high (3).

PO4 Verbs: Analyze (L4)

CO2 Action Verb is equal to PO4 verb; Therefore correlation is high (3).

CO3: Apply the Verilog constructs in HDL for various combinational circuits design.

Action Verb: Apply (L3)

PO1 Verbs: Apply (L3)

CO3 Action Verb is equal to PO1 verb; Therefore correlation is high (3).

PO2 Verb: Review (L2)

CO3 Action Verb is greater than PO2 verb; Therefore correlation is high (3).

PO3 Verb: Develop (L3)

CO3 Action Verb is equal to PO3 verb; Therefore correlation is high (3).

PO4 Verbs: Interpret (L2)

CO3 Action Verb is greater than PO4 verb; Therefore correlation is high (3).

CO4: Analyze the sequential logic circuits design using flip flops and Verilog constructs.

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3)

CO4 Action Verb is greater to PO1 verb; Therefore correlation is high (3).

PO2 Verb: Identify (L3)

CO4 Action Verb greater to PO1 verb; Therefore correlation is high (3).

PO3 Verb: Develop (L3)

CO4 Action Verb greater to PO1 verb; Therefore correlation is high (3).

PO4 Verb: Analyze (L4)

CO4 Action Verb is equal to PO4 verb; Therefore correlation is high(3).

CO5: Analyze the Finite State Machines and realization of Programmable Logic Devices.

Action Verb: Analyze (L4)

PO1 Verb: Apply (L3)

CO5 Action verb is greater to PO1 verb; therefore the correlation is high (3).

PO2 verb: Identify (L3)

CO5 Action verb is greater than PO2 verb ; therefore the correlation is high (3).

PO3 verb: Develop (L3)

CO5 Action Verb is less than PO3 verb ; Therefore correlation is high (3).

PO4 Verb: Analyze (L4)

CO4 Action Verb is equal to PO4 verb; Therefore correlation is high(3).

Annamacharya Institute of Technology & Sciences :: Tirupati
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AK23 Regulations

ELECTRONICS COMMUNICATION AND ENGINEERING (ECE)

Course Code	Year & Sem		L	T	P	C
23APC0403	II-I	Electronic Devices and Circuits Lab	0	0	3	1.5

Course Outcomes: After studying the course, Student will be able to:

CO1 **Analyze** the characteristics of UJT and various Clipping & Clamping circuits using PN junction diodes.

CO2 **Evaluate** the parameters of BJT from its input-output characteristics in three different configurations

CO3 **Evaluate** the parameters of JFET and MOSFETs from their characteristics in Common Source Configuration

CO4 **Analyze** the operation of various DC biasing circuits and switching circuits using BJT and MOSFETs

CO5 **Analyze** the frequency response of amplifier using BJT (Common Emitter) and MOSFET (Common Source).

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Analyze	the characteristics of UJT and various Clipping & Clamping circuits	using PN junction diodes		L4
CO2	Evaluate	the parameters of BJT from its input-output characteristics		in three different configurations	L5
CO3	Evaluate	the parameters of JFET and MOSFETs from their characteristics		in Common Source Configuration	L5
CO4	Analyze	the operation of various DC biasing circuits and switching circuits	using BJT and MOSFETs		L4
CO5	Analyze	the frequency response of amplifier	using BJT (Common Emitter) and MOSFET (Common Source)		L4

LIST OF EXPERIMENTS: (Implement/Execute any 10 experiments).

1. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs. (CO1)
2. Study and draw the Volt Ampere characteristics of UJT and determine η, IP, Iv, V_P, & Vv from the experiment. (CO1)
3. Verification of the input and output characteristics of BJT in Common Emitter configuration experimentally and find required parameters from the graphs. (CO2)
4. Study and draw the input and output characteristics of BJT in Common Base configuration experimentally and determine required parameters from the graphs. (CO2)
5. Verification of the input and output characteristics of BJT in Common Collector configuration experimentally and find required parameters from the graphs. (CO2)
6. Study and draw the drain and transfer characteristics of JFET in Common Source configuration experimentally. Find I_{DSS}, g_m and V_p from the graph. (CO3)
7. Study and draw the output and transfer characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find Threshold voltage (VT), gm, & K from the graphs. (CO3)
8. Study and draw the output and transfer characteristics of MOSFET (Depletion mode) or JFET in Common Source Configuration experimentally. Find IDSS, gm, & VP from the graphs. (CO3)
9. Design and analysis of voltage-divider bias/self-bias circuit using BJT. (CO4)
10. Design and analysis of self-bias circuit using MOSFET. (CO4)
11. Design a suitable circuit for switch using MOSFET/BJT. (CO4)
12. Design a small signal amplifier using BJT (Common Emitter) for the given specifications. Draw the frequency response and find the bandwidth. (CO5)
13. Design a small signal amplifier using MOSFET (Common Source) for the given specifications. Draw the frequency response and find the bandwidth. (CO5)

Tools/Equipment Required: Software Tool like Multisim/Pspice or Equivalent,
DC Power supplies, Multimeters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

Mapping of Course Outcomes with Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3										2	2
CO2	3	3	3	3								3	3
CO3	3	3	2									3	3
CO4	3	3	1	3								2	2
CO5	3	3	1	3								3	3

Correlation matrix

Expt. No.	CO					Program Outcome (PO)	PO(s): Action Verb and BTL (for PO1 to PO11)	Level of Correlation (0-3)
	Lesson Plan (Hrs.)	%	Correlation	Co's Action verb	BTL			
1,2	6	15	2	Analyze	L4	PO1, PO2	PO1: Apply (L3) PO2: Review(L2)	3 3
3,4,5	9	23	3	Evaluate	L5	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Develop(L3) PO4: Analyze(L4)	3 3 3 3
6,7,8	9	24	3	Evaluate	L5	PO1, PO2, PO3	PO1: Apply(L3) PO2: Review (L2) PO3: Design (L6)	3 3 2
9,10,11	9	23	3	Analyze	L4	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Design(L6) PO4: Analyze(L4)	3 3 1 3
12,13	6	15	2	Analyze	L4	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Design(L6) PO4: Analyze(L4)	3 3 1 3
	39	100 %						

Justification Statements:

CO1: Analyze the characteristics of UJT and various Clipping & Clamping circuits using PN junction diodes.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO1 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Review (L2)
CO1 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).

CO2: Evaluate the parameters of BJT from its input-output characteristics in three different configurations.
Action Verb: Evaluate (L5)
PO1 Verbs: Apply (L3)
CO2 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Review (L2)
CO2 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO3 Verbs: Develop (L3)
CO2 Action Verb is greater than PO3 verb; Therefore, the correlation is high (3).

PO4 Verbs: Analyze (L4)

CO2 Action Verb is equal to PO4 verb; Therefore, the correlation is high (3).

CO3: Evaluate the parameters of JFET and MOSFETs from their characteristics in Common Source Configuration.

Action Verb: Evaluate (L5)

PO1 Verbs: Apply (L3)

CO3 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).

PO2 Verb: Review (L2)

CO3 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).

PO3 Verb: Design (L6)

CO3 Action Verb is less than PO3 verb by one level; Therefore, the correlation is moderate (2).

CO4: Analyze the operation of various DC biasing circuits and switching circuits using BJT and MOSFETs.

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3)

CO4 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).

PO2 Verb: Review (L2)

CO4 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).

PO3 Verb: Design (L6)

CO4 Action Verb is less than PO3 verb by two levels; Therefore, the correlation is low (1)

PO4 Verb: Analyze (L4)

CO4 Action Verb is same as PO4 verb; Therefore, the correlation is high (3).

CO5: Analyze the frequency response of amplifier using BJT (Common Emitter) and MOSFET (Common Source).

Action Verb: Analyze (L4)

PO1 Verb: Apply (L3)

CO5 Action verb is greater than PO1 verb; Therefore, the correlation is high (3).

PO2 verb: Review (L2)

CO5 Action verb is greater than PO2 verb; Therefore, the correlation is high (3).

PO3 verb: Design (L6)

CO5 Action verb is less than PO3 verb by two levels; Therefore, the correlation is high (1).

PO4 verb: Analyze (L4)

CO5 Action verb is same as PO4 verb; Therefore, the correlation is high (3).

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AK23 Regulations
ELECTRONICS COMMUNICATION AND ENGINEERING (ECE)

Course Code	Year & Sem		L	T	P	C
23APC0404	II-I	Digital Circuits and Signal Simulation Lab	0	0	3	1.5

Course Outcomes: After studying the course, Student will be able to:

CO1 **Analyze** the construction and operation of various combinational circuits using logic gates.

CO2 **Evaluate** th**e** Universal Shift Register in different modes and various counters using Flip flops**.**

CO3 **Analyze** the generation of standard signals, operations between them and sampling theorem

CO4 **Evaluate** the spectrum of a periodic and aperiodic signals using FS and FT respectively.

CO5 **Analyze** the system properties, filter responses, Gaussian noise, random data and pole-zero plots

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Analyze	the construction and operation of various combinational circuits	using logic gates		L4
CO2	Evaluate	th**e** universal shift register in different modes and various counters	using Flip flops		L5
CO3	Analyze	the generation of signals, operations between them and sampling theorem			L4
CO4	Evaluate	the spectrum of a periodic and aperiodic signals	using FS and FT respectively		L5
CO5	Analyze	the system properties, filter responses, Gaussian noise, random data and pole-zero plots			L4

List of Experiments:

PART A

1. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit.(CO1)
2. Verification of functional table of 3 to 8-lineDecoder/De-multiplexer(CO1)
3. 4 variable logic function verification using 8 to1multiplexer.(CO1)
4. Design full adder circuit and verify its functional table.(CO1)
5. Design a four-bit ring counter using D Flip – Flops/JK Flip Flop and verify output.(CO2)
6. Design a four-bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output (CO2)
7. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.(CO2)
8. 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.(CO2)
9. Design MOD–8 synchronous counter using T Flip-Flop and verify the result and sketch the output waveforms. (CO2)
10. (a)Draw the circuit diagram of a single bit comparator and test the output
    (b)Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.(CO1)

Note: Design and verify combinational and sequential circuits using Hardware Description Language

References:

1.M. Morris Mano, "Digital Design", 3rdEdition,PHI

List of Experiments:

PART B

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function. (CO3)
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power. (CO3)
3. Write a program to find the trigonometric &exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal. (CO4)
4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum. (CO4)
5. Write a program to convolve two discrete time sequences. Plot all the sequences. (CO3)
6. Write a program to find auto correlation and cross correlation of given sequences. (CO3)
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous System. (CO5)
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal. (CO3)
9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.(CO5)
10. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).(CO5)
11. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec. (CO5)
12. To plot pole-zero diagram in S-plane of given continuous system and verify its stability. (CO5)

Note: Any 10 experiments. All the experiments are to be simulated using MATLAB or equivalent software.

References:

1.Stephen J. Chapman, "MATLAB Programming for Engineers",Cengage,November2012.

Mapping of Course Outcomes with Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	3								3
CO2	3	3	3	3	3								3
CO3	3	1		3	3								2
CO4	3	2		3	3								2
CO5	3		3	1	3								2

Correlation matrix

Expt. No.	CO					Program Outcome (PO)	PO(s): Action Verb and BTL (for PO1 to PO11)	Level of Correlation (0-3)
	Lesson Plan (Hrs.)	%	Correlation	CO's Action verb	BTL			
DC: 1,2,3, 4,10	15	23	3	Analyze	L4	PO1, PO2, PO3, PO4, PO5	PO1: Apply (L3) PO2: Identify(L3) PO3: Develop(L3) PO4: Analyze(L4) PO5:Apply(L3)	3 3 3 3 3
DC: 5,6,7, 8,9	15	23	2	Evaluate	L5	PO1, PO2, PO3, PO4, PO5	PO1: Apply (L3) PO2: Identify(L3) PO3: Develop(L3) PO4: Analyze(L4) PO5:Apply(L3)	3 3 3 3 3
SS: 1,2,8	9	13	2	Analyze	L4	PO1, PO2, PO4, PO5	PO1: Apply (L3) PO2: Formulate(L6) PO4: Analyze(L4) PO5: Apply(L3)	3 1 3 3
SS:3, 4	6	9	2	Evaluate	L5	PO1, PO2,	PO1: Apply (L3) PO2:	3 2

						PO4, PO5	Formulate(L6) PO4: Analyze(L4) PO5: Apply(L3)	3 3
SS: 5,6,7, 9,10, 11,12	**21**	32	**3**	Analyze	**L4**	PO1, PO3, PO4, PO5	PO1: Apply (L3) PO3: Develop(L3) PO4: Design(L6) PO5: Apply(L3)	3 3 1 3
	66	**100 %**						

Justification Statements:

CO1: Analyze the construction and operation of various combinational circuits using logic gates.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO1 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Identify (L3)
CO1 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO3 Verbs: Develop (L3)
CO1 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO4 Verbs: Analyze (L4)
CO1 Action Verb is equal to PO4 verb; Therefore, the correlation is high (3).
PO5 Verbs: Apply (L3)
CO1 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

CO2: Evaluate th**e** Universal Shift Register in different modes and various counters using Flip flops**.**
Action Verb: Evaluate (L5)
PO1 Verbs: Apply (L3)
CO2 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Identify (L3)
CO2 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO3 Verbs: Develop (L3)
CO2 Action Verb is greater than PO3 verb; Therefore, the correlation is high (3).
PO4 Verbs: Analyze (L4)
CO2 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).
PO5 Verbs: Apply (L3)
CO2 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

CO3: Analyze the generation of standard signals, operations between them and sampling theorem.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO3 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Formulate (L6)
CO3 Action Verb is less than PO2 verb by two levels; Therefore, the correlation is low (1).
PO4 Verbs: Analyze (L4)
CO3 Action Verb is equal to PO4 verb; Therefore, the correlation is high (3).
PO5 Verbs: Apply (L3)
CO3 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

CO4: Evaluate the spectrum of a periodic and aperiodic signals using FS and FT respectively.
Action Verb: Evaluate (L5)
PO1 Verbs: Apply (L3)
CO4 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Formulate (L6)
CO5 Action Verb is less than PO2 verb one level; Therefore, the correlation is medium(2).
PO4 Verbs: Analyze (L4)

CO4 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

PO5 Verbs: Apply (L3)

CO4 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

CO5: Analyze the system properties, filter responses, Gaussian noise, random data and pole-zero plots

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3)

CO5 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).

PO3 Verbs: PO3: Develop (L3)

CO5 Action Verb greater than PO3 verb; Therefore, the correlation is high (3).

PO4 Verbs: Design (L6)

CO5 Action Verb is less than PO4 verb by two levels; Therefore, the correlation is low(1).

PO5 Verbs: Apply (L3)

CO5 Action Verb is greater than PO5 verb; Therefore, the correlation is high (3).

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AK23 Regulations
COMPUTER SCIENCE AND ENGINEERING (CSE)

Course Code	Year & Sem	PYTHON PROGRAMMING	L	T	P	C
23ASC0501	II-I	(SKILL ENHANCEMENT COURSE) (Common to CSE,CIC,CSE(DS), AIDS,AIML,ECE & ME)	0	1	2	2

Course Outcomes:

After studying the course, student will be able to

CO1: Understand the Basic concepts of python programming to build scripts in IDLE.

CO2: Apply the modularity techniques to invoke user defined functions**.**

CO3: Apply the concept of Dictionaries, Tuples and sets to perform operations on data.

CO4: Analyze the file concepts and oops paradigms to manage data.

CO5: Apply the concepts of JSON and XML for data processing.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Understand	Basic concepts of python programming		to build scripts in IDLE	L2
CO2	Apply	The modularity techniques		to invoke user defined functions	L3
CO3	Apply	the concept of Dictionaries, Tuples and sets		to perform operations on data.	L3
CO4	Analyze	the file concepts and oops paradigms.		to manage data	L4
CO5	Apply	The concepts of JSON and XML		for data processing	L3

UNIT– I	9Hrs

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 with in an interval
3. Write a program to swap two numbers with out 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)Bitwise 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	9Hrs

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:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Writeaprogramtofindthelengthofthestringwithoutusinganylibraryfunctions.
10. Write a program to check if the substring is presenting invest ring or not.
11. Write a program to perform the given operations on a list:
    i.Addition ii.Insertion iii.slicing
12. Write a program to perform any 5 built-in functions by taking any list.

UNIT–III	9Hrs

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:

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

UNIT–IV	9Hrs

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:

18. 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.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its are and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT–V	9Hrs

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

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array() function.
26. Python program to demonstrate use of n dim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. 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:
    a) Apply head() function to the p and as data frame
    b) Perform various data selection operations on Data Frame
30. 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 matplot lib

Reference Books:
1. Gowrishankar S,Veena A.,Introduction to Python Programming, CRCPress. 2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024 3. Introduction to Programming Using Python, Y.DanielLiang, 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

Mapping of course outcomes with program outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	2		2							1	
CO2	3	3	3	2	3								2
CO3	3	3	3	2	3								2
CO4	3	3	3	3	3						2		
CO5	3	3	3	2	3								2

Correlation matrix

Unit No.	CO					Program Outcome (PO)	PO(s): Action Verb and BTL(for PO1 to PO11)	Level of Correlation (0-3)
	Lesson plan(Hrs)	%	Correlation	Co's Action verb	BTL			
1	9	20	2	CO1 : Understand	L2	PO1 PO2 PO3 PO5	PO1: Apply(L3) PO2: Review(L2) PO3:Develop(L3) PO5:Apply(L3)	2 3 2 2
2	9	20	2	CO2: Apply	L3	PO1 PO2 PO3 PO4 PO5	PO1: Apply(L3) PO2: Review(L2) PO3:Develop(L3) PO4: Analyze(L4) PO5:Apply(L3)	3 3 3 2 3
3	9	20	2	CO3: Apply	L3	PO1 PO2 PO3 PO4 PO5	PO1: Apply(L3) PO2: Review(L2) PO3:Develop(L3) PO4: Analyze(L4) PO5:Apply(L3)	3 3 3 2 3
4	9	20	2	CO4: Analyze	L4	PO1 PO2 PO3 PO4 PO5 PO11	PO1: Apply(L3) PO2: Review(L2) PO3:Develop(L3) PO4: Analyze(L4) PO5:Apply(L3) PO11:Thumb Rule	3 3 3 3 3 2
5	9	20	2	CO5: Apply	L3	PO1 PO2 PO3 PO4 PO5	PO1: Apply(L3) PO2: Review(L2) PO3:Develop(L3) PO4: Analyze(L4) PO5:Apply(L3)	3 3 3 2 3
	53	100 %						

Justification Statements:

CO1: Understand the Basic concepts of python programming to build scripts in IDLE.

Action Verb : Understand(L2)

PO1 Verb : Apply(L3)
CO1 Action verb is less than PO1 verb by one level. Therefore the correlation is moderate (2)
PO2 Verb : Review(L2)
CO1 Action verb is same as PO2 verb. Therefore the correlation is high (3)
PO3 Verb : Develop(L3)
CO1 Action verb is less than PO3 verb by one level. Therefore the correlation is moderate (2)
PO5 Verb : Apply(L3)
CO1 Action verb is less than PO5 verb by one level. Therefore the correlation is moderate (2)
CO2: Apply the modularity techniques to invoke user defined functions**.**
Action Verb : Apply (L3)
PO1: Apply(L3)
CO2 Action verb is same as PO1 verb. Therefore the correlation is high (3)
PO2 Verb : Review(L2)
CO2 Action verb is greater than PO2 verb. Therefore the correlation high (3)
PO3 Verb : Develop (L3)
CO2 Action verb same as PO3 verb. Therefore the correlation high (3)
PO4 Verb : Analyze(L4)
CO2 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)
PO5 Verb : Apply(L3)
CO2 Action verb is same as PO5 verb. Therefore the correlation is high (3)
CO3: Apply the concept of Dictionaries, Tuples and sets to perform operations on data.
Action Verb : Apply(L3)
PO1: Apply(L3)
CO3 Action verb is same as PO1 verb. Therefore the correlation is high (3)
PO2 Verb : Review(L2)
CO3 Action verb is greater than PO2 verb. Therefore the correlation high (3)
PO3 Verb : Develop (L3)
CO3 Action verb same as PO3 verb. Therefore the correlation high (3)
PO4 Verb : Analyze(L4)
CO3 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)
PO5 Verb : Apply(L3)
CO3 Action verb is same as PO5 verb. Therefore the correlation is high (3)
CO4: Analyze the file concepts and oops paradigms to manage data.
Action Verb: Analyze(L4)
PO1: Apply(L3)
CO4 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2 Verb : Review(L2)
CO4 Action verb is greater than PO2 verb. Therefore the correlation high (3)
PO3 Verb : Develop (L3)
CO4 Action verb is greater than PO3 verb. Therefore the correlation high (3)
PO4 Verb : Analyze(L4)
CO4 Action verb is same as PO4 verb. Therefore the correlation is high (3)
PO5 Verb : Apply(L3)
CO4 Action verb is greater than PO5 verb. Therefore the correlation is high (3)
PO11: Thumb rule
To solve the real time problems oops and file concepts are necessary for data security. Therefore the correlation is medium(2)
CO5: Apply the concepts of JSON and XML for data processing.
Action Verb : Apply(L3)
PO1: Apply(L3)
CO5 Action verb is same as PO1 verb. Therefore the correlation is high (3)

PO2 Verb : Review(L2)

CO5 Action verb is greater than PO2 verb. Therefore the correlation high (3)

PO3 Verb : Develop (L3)

CO5 Action verb same as PO3 verb. Therefore the correlation high (3)

PO4 Verb : Analyze(L4)

CO5 Action verb is less than PO4 verb by one level. Therefore the correlation is moderate (2)

PO5 Verb : Apply(L3)

CO5 Action verb is same as PO5 verb. Therefore the correlation is high (3)

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AK23-REGULATIONS

B.TECH.–ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.– II Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T	P	C			
1	HM	23AHMMB01	Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
2	ES	23AES0203	Linear Control Systems	3	0	0	3	30	70	100
3	PC	23APC0405	EM Waves and Transmission Lines	3	1	0	3	30	70	100
4	PC	23APC0406	Electronic Circuits Analysis	3	0	0	3	30	70	100
5	PC	23APC0407	Analog and Digital Communications	3	1	0	3	30	70	100
6	PC	23APC0408	Electronic Circuits Analysis Lab	0	0	3	1.5	30	70	100
7	PC	23APC0409	Analog and Digital Communications Lab	0	0	3	1.5	30	70	100
8	SC	23ASC9901	Soft Skills	0	1	2	2	30	70	100
9	ES	23AES0304	Design Thinking & Innovation	1	0	2	2	30	70	100
10	Audit Course	23AMC9901	Environmental Science	2	0	0	0	30	-	30
Total				17	3	10	21	300	630	930
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation										

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AK23 Regulations

Course Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T/CLC	P	C
23AHMMB01		2	0	0	2

(Common to ALL branches of Engineering)

Course Outcomes (CO):
CO1: Understand the fundamentals of managerial economics and Apply the forecasting techniques for estimation of demand.
CO2: Understand the production and cost concepts to optimize the output
CO3: Analyze the price output relationship in different markets.
CO4: Evaluate the capital budgeting techniques to invest in various projects.
CO5: Analyze the accounting statements to evaluate the financial performance of business entity.

CO	Action Verb	Knowledge Statement	Condition	Criteria	BL
CO1	Understand Apply	The fundamentals of Managerial economics and the demand of a product	by using statistical and survey methods.		L3
CO2	Understand	Production and cost concepts		To optimize the output	L2
CO3	Analyze	Price output relationship		In perfect and imperfect competition markets	L4
CO4	Evaluate	Capital budgeting techniques		To invest in various projects	L5
CO5	Analyze	Accounting statements		to evaluate the financial performance of business entity	L4

UNIT – I : Managerial economics

Introduction – meaning, nature, significance, functions, and advantages, ME and its role in other fields. Demand - Concept, Function, Law of Demand- Demand Elasticity-Types– Measurement. Demand Forecasting- Factors governing forecasting, Methods.

UNIT-II : Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Short run and Long run Production Function- Iso quants and Iso costs, MRTS, Cobb-Douglas Production Function- Laws of Returns- Internal and External Economies of scale. Cost & Break-Even Analysis- Cost concepts and Cost behavior- Break- Even Analysis (BEA) – Determination of Break-Even Point (Simple Problems) – Managerial significance and limitations of Break-Even Analysis.

Business Organizations and Markets

UNIT-III :

Introduction-Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition, Monopoly- Monopolistic Competition– Oligopoly- Price-Output Determination- Pricing Methods and strategies.

Capital Budgeting

UNIT-IV :

Introduction- Nature, meaning, significance, types of working capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method, Profitability Index(PI) Method (simple problems).

UNIT-V : Financial Accounting and Analysis

Introduction - Concepts and Conventions- Double- Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). **Financial Analysis -** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Text books:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

1. Ahuja Hl Managerial economics Schand, 3/e, 2013
2. S.A.Siddiqui and A.S.Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
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, 2013.

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.

Course Title	COs	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
Managerial Economics and	CO1	3												
	CO2	1									1			
	CO3	3									3			
	CO4										3			
	CO5										3			

Correlation matrix

Unit No.	CO					Program Outcome (PO)	PO(s):Action Verb and BTL	Level of Correlation (0-3)
	Lesson plan(Hrs)	%	Correlation	Co's Action verb	BTL			
1	10	16.1%	2	CO1: Apply	L3	PO1	Apply	**3**
2	14	22.5%	3	CO2: Understand	L2	PO1, PO10	Apply Apply	**1** **1**
3	14	22.5%	3	CO3: Analyze	L4	PO1, PO10	Apply Apply	**3** **3**
4	10	16.1%	2	CO4: Evaluate	L5	PO10	Apply	**3**
5	14	22.5%	3	CO5: Analyze	L4	PO10	Apply	**3**
Total	**62**	**100**						

Justification Statements:

CO1: Understand the fundamentals of managerial economics and apply the forecasting techniques for estimation of demand.

Action Verb: Apply (L3)

PO1 Verb: Apply (L3)

CO1 Action verb is same as PO1verb. Therefore the correlation is high (3)

CO2: Understand the production and cost concepts to optimize the output.

Action Verb: Understand (L2)
PO1: Apply (L3)
CO2 Action verb is less than PO1 verb by two levels. Therefore the correlation is low (1)
PO10: Apply (L3)
CO2 Action verb is less than PO1 verb by two levels. Therefore the correlation is low (1)

CO3: Analyze the price output relationship in different markets.
Action Verb: Analyze (L4)
PO1: Apply (L3)
CO3 Action verb is more than PO1 verb by one level. Therefore the correlation is high (3)
PO10: Apply (L3)
CO3 Action verb is more than PO1 verb by one level. Therefore the correlation is high (3)

CO4: Evaluate the capital budgeting techniques to invest in various projects.
Action Verb: Evaluate (L5)
PO10: Apply (L3)
CO4 Action verb is more than PO1 verb by one level. Therefore the correlation is high (3)

CO5: Analyze the accounting statements to evaluate the financial performance of business entity.
Action Verb: Analyze (L4)
PO10: Apply (L3)
CO5 Action verb is more than PO1 verb by one level. Therefore the correlation is high (3)

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Year: II **Semester: II** **Branch of Study: ECE**

Subject Code	Subject Name	L	T	P	Credits
23AES0203	Linear Control Systems	3	0	0	3

Course Outcomes:

After completion of the course, students will be able to:

CO1: Understand the concept of block diagram reduction and signal flow graph methods, transfer function of D.C Servo motor, A.C Servo motor and Synchros.

CO2: Analyze the time response of first order system, transient response of second order system, steady state errors and controllers.

CO3: Analyze the stability of a system in time domain using the root locus and Routh-Hurwitz stability criteria.

CO4: Analyze the stability of a system in frequency domain using Bode, Polar and Nyquist plots.

CO5: Evaluate the response of continuous systems using state space models.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Bloom's level
CO1	Understand	The concept of block diagram reduction and signal flow graph methods, transfer function of D.C Servo motor, A.C Servo motor and Synchros.			L2
CO2	Analyze	The time response of first order system, transient response of second order system, steady state errors and controllers.			L4
CO3	Analyze	The stability of a system in time domain.	Using the root locus and Routh-Hurwitz stability criteria.		L4
CO4	Analyze	The stability of a system in frequency domain	Using Bode, Polar and Nyquist plots.		L4
CO5	Evaluate	the response of continuous systems	Using state space models.		L5

SYLLABUS

UNIT-I

Control systems concepts

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Controller components, DC Servomotor and AC Servo motor their transfer functions, Synchros.

UNIT-II

Time response analysis

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, Study of effects and Design of P, PI, PD and PID Controllers on second order system.

UNIT-III

Stability analysis in time domain

The concept of stability – Routh's stability criterion – Stability and conditional stability - limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT-IV

Frequency response analysis

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram - Stability Analysis from Bode Plots. Polar Plots- Nyquist Plots- Phase margin and Gain margin-Stability Analysis.

Compensation techniques – Study of Effects and Design of Lag, Lead, Lag-Lead Compensator design in frequency Domain on a second order system.

UNIT-V

State space analysis of continuous systems

Concepts of state, state variables and state model - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and its Properties. System response through State Space models. The concepts of controllability and observability.

Textbooks:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

Reference Books:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, Mc Graw Hill Education, 2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition, 2003.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami-Naeini, 6th Edition, Pearson, 2010.

Web Resources:

1. https://nptel.ac.in/courses/108102043
2. https://nptel.ac.in/courses/108106098.

Mapping of Course outcomes with Program outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1										3	
CO2	3	3										3	
CO3	3	3	1									3	
CO4	3	3	1									3	
CO5	3	3	2									3	

(Levels of correlation, viz., 1. Low, 2. Moderate, 3. High)

Mapping of Course outcomes with Program outcomes Justification Table

CO No.	CO					Program Outcomes (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of correlation (0-3)
	Lesson Plan (Hrs.)	%	correlation	Verb	BTL			
CO1				Understand	L2	PO1, PO2	Apply (L3), Analyze (L4)	2 1
CO2				Analyze	L4	PO1, PO2	Apply (L3), Analyze (L4)	3 3
CO3				Analyze	L4	PO1, PO2, PO3	Apply (L3), Analysis (L4), Design (L6)	3 3 1
CO4				Analyze	L4	PO1, PO2, PO3	Apply (L3), Analyze (L4), Design (L6)	3 3 1
CO5				Evaluate	L5	PO1, PO2, PO3	Apply (L3), Analyze (L4), Design (L6)	3 3 2

JUSTIFICATION STATEMENTS:

CO1: Understand the concept of block diagram reduction and signal flow graph methods, transfer function of D.C Servo motor, A.C Servo motor and Synchros.
Action Verb: Understand (L2)
PO1 Verb: Apply (L3)
CO1 Action verb level is less than PO1 verb by one level; Therefore, correlation is Moderate (2).
PO2 Verb: Analyze (L4)
CO1 Action verb level is less than PO2 verb by two level; Therefore, correlation is Low (1).

CO2: Analyze the time response of first order system, transient response of second order system, steady state errors and controllers.
Action Verb: Analyze (L4)
PO1 Verb: Apply (L3)
CO2 Action verb level is greater than PO1 verb by one level; Therefore, correlation is Hugh (3).
PO2 Verb: Analyze (L4)
CO2 Action verb level is equal to PO2 verb; Therefore, correlation is High (3).

CO3: Analyze the stability of a system in time domain using the root locus and Routh-Hurwitz stability criteria.
Action Verb: Analyze (L4)
PO1 Verb: Apply (L3)
CO3 Action verb level is greater than PO1 verb by one level; Therefore, correlation is High (3).
PO2 Verb: Analysis (L4)
CO3 Action verb level is equal to PO2 verb level; Therefore, correlation is High (3).
PO3 Verb: Design (L6)
CO3 Action verb level is less than PO3 verb by two levels; Therefore correlation is Low (1).

CO4: Analyze the stability of a system in frequency domain using Bode, Polar and Nyquist plots.
Action Verb: Analyze (L4)
PO1 Verb: Apply (L3)
CO4 Action verb level is greater than PO1 verb by one level; Therefore, correlation is High (3).
PO2 Verb: Analysis (L4)
CO4 Action verb level is equal to PO2 verb level; Therefore, correlation is High (3).
PO3 Verb: Design (L6)
CO4 Action verb level is less than PO3 verb by two levels; Therefore correlation is Low (1).

CO5: Evaluate the response of continuous systems using state space models.
Action Verb: Evaluate (L5)
PO1 Verb: Apply (L3)
CO5 Action verb level is greater than PO1 verb by two levels; Therefore, correlation is High (3).
PO2 Verb: Analysis (L4).
CO5 Action verb level is greater than PO2 verb by one level; Therefore, correlation is High (3).
PO3 Verb: Design (L6)
CO5 Action verb level is less than PO3 verb by one level; Therefore, correlation is Moderate (2).

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ELECTRONICS COMMUNICATION AND ENGINEERING (ECE)

Course Code	Year & Sem	EM Waves and Transmission lines	L	T/CLC	P	C
23APC0405	II-II		3	1	0	3

Course Outcomes: After studying the course, Student will be able to:
CO1: Understand the Vector Algebra and Electrostatic fields using Coulomb's law and Gauss law.
CO2: Understand the concepts of Magneto static fields and Time varying fields.
CO3:Analyze the propagation of Electromagnetic waves in conductors and Dielectric media.
CO4:Understand the concepts of transmission line types and its parameters.
CO5:Analyze different applications of transmission lines using Smith chart.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Understand	The Vector algebra and electromagnetic fields	Using coulombs law and gauss law		L2
CO2	Understand	The concepts of magneto static fields and time varying fields	Using BIOT Savarts law and amperes circuit law		L2
CO3	Analyze	The propagation of electromagnetic waves in conductors and dielectric media			L4
CO4	Understand	The concepts of transmission line types and its parameters			L2
CO5	Analyze	Different applications of transmission lines using smith chart			L4

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, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

UNIT II
Magnetostatics: Biot-Savart 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, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, 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, Low loss radio frequency and UHF Transmission lines, UHF Lines as Circuit Elements, Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

Textbooks:
Elements of Electro magnetics, MatthewN. O.Sadiku, 4thEdition, Oxford University Press, 2008.
Electromagnetic Waves and Radiating Systems,E.C.JordanandK.G.Balmain,2nd Edition, PHI, 2000.

References:

Electromagnetic Field Theory and Transmission Lines, G.S.N.Raju, 2nd Edition, Pearson Education, 2013.
Engineering Electromagnetics, WilliamH. Hayt Jr. and John A. Buck, 7th Edition, Tata McGraw Hill, 2006.
Electromagnetics, JohnD.Krauss,3rd Edition,McGrawHill, 1988.
Networks, Lines, and Fields, John D.Ryder,2nd Edition, PHI publications, 2012.

Mapping of course outcomes with program outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2										3	2
CO2	2	2										3	1
CO3	3	3										2	
CO4	2	2										2	
CO5	3	3										3	

Correlation matrix:

Unit No.	CO					Program Outcome (PO)	PO(s) :Action Verb and BTL(for PO1 to PO11)	Level of Correlation (0-3)
	Lesson plan(Hrs)	%	Correlation	Co's Action verb	BTL			
1	10	16	2	Understand	L2	PO1,PO2	PO1: Apply(L3) PO2:Identify (L3)	2 2
2	10	16	2	Understand	L2	PO1,PO2	PO1: Apply (L3) PO2: Identify (L3)	2 2
3	15	23	3	Analyze	L4	PO1,PO2	PO1:Apply(L3) PO2:Identify(L3)	3 3
4	14	22	3	Understand	L2	PO1, PO2	PO1:Apply(L3) PO2:Identify(L3)	2 2
5	14	22	3	Analyze	L4	PO1,PO2	PO1:Apply(L3) PO2: Identify(L3)	3 3
	63							

Justification Statements:

CO1: Understand the vector algebra and electrostatic fields using coulomb's law and Gauss law.
Action Verb: Understand (L2)
PO1 Verbs: Apply (L3) CO1 Action Verb is less than to PO1 verb; Therefore correlation is moderate (2).
PO2 Verbs: Identify (L3) CO1 Action Verb is less than to PO2 verb; Therefore correlation is moderate (2).

CO2: Understand the concept of magnetostatic fields and time varying fields.
Action Verb: Understand (L2)
PO1 Verbs: Apply (L3) CO2 Action Verb is less than to PO1 verb; Therefore correlation is moderate (2).
PO2 Verbs: Identify (L3) CO2 Action Verb is less than to PO2 verb; Therefore correlation is moderate (2).

CO3:Analyze the propagation of electromagnetic waves in conductors and dielectric media.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3) CO3 Action Verb is greater to PO1 verb; Therefore correlation is high (3).
PO2 Verb: Identify (L3) CO3 Action Verb level is greater to PO2 verb; Therefore correlation is high (3).

CO4:Understand the concepts of transmission line types and its parameters.
Action Verb: Understand (L2)
PO1 Verbs: Apply (L3) CO4 Action Verb is less than to PO1 verb; Therefore correlation is moderate (2).
PO2 Verbs: Identify (L3) CO4 Action Verb is less than to PO2 verb; Therefore correlation is moderate (2).

CO5:Analyze different applications of transmission lines using smith chart.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3) CO5 Action Verb is greater to PO1 verb; Therefore correlation is high (3).
PO2 Verb: Identify (L3) CO5 Action Verb level is greater to PO2 verb; Therefore correlation is high (3).

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ELECTRONICS COMMUNICATION AND ENGINEERING (ECE)

Course Code	Year & Sem		L	T/CLC	P	C
23APC0406	II-II	Electronic Circuits Analysis	3	1	0	3

Course Outcomes: After studying the course, Student will be able to:

CO1 **Understand** the multi stage amplifiers and differential amplifiers using BJT and MOSFET.

CO2 **Apply** the hybrid π model for amplifiers using BJT and MOSFET at high frequencies

CO3 **Evaluate** the parameters of four feedback amplifiers and frequency of various oscillators.

CO4 **Understand** the principle of operation of different power amplifiers using BJT and MOSFET.

CO5 **Analyze** the operation of three types of tuned amplifiers, multivibrators and Schmitt trigger.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Understand	the multi stage amplifiers and differential amplifiers	using BJT and MOSFET		L2
CO2	Apply	the hybrid π model for amplifiers	using BJT and MOSFET at high frequencies		L4
CO3	Evaluate	the parameters of four feedback amplifiers and frequency of various oscillators			L5
CO4	Understand	the principle of operation of different power amplifiers	using BJT and MOSFET		L2
CO5	Analyze	the operation of three types of tuned amplifiers, multivibrators and Schmitt trigger			L4

UNIT I

Multistage & Differential Amplifiers: Introduction, Classification of Amplifiers, Distortion in amplifiers, Coupling Schemes, RC Coupled Amplifier using BJT ,Cascaded RC Coupled BJT Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, and other Non ideal Characteristics of the Differential Amplifier.

UNIT II

Frequency Response: Low-Frequency Response of the CE and CS Amplifiers, Internal Capacitive Effects and the High-Frequency Model of BJT & MOSFET, High- Frequency Response of the CE, Emitter follower, CS, CD, f_β,f_T and gain bandwidth product.

UNIT III

Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, Series—Shunt, Series—Series, Shunt—Shunt, Shunt—Series.

Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Relaxation Oscillator, Crystal Oscillators, Illustrative Problems.

UNIT IV

Power Amplifiers: Introduction, Class A amplifiers (Series fed, Transformer coupled, Push pull), Second Harmonic distortion, Class B amplifiers (Push pull, Complementary symmetry), Crossover distortion and Class AB operation, Class C amplifiers, Power BJTs, MOS power transistors.

UNIT V

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

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

Textbooks:

1. Adel. S.Sedra and Kenneth C.Smith, "Micro Electronic Circuits," 6th Edition, Oxford University Press, 2011.
2. J.Millman, H.Tauband Mothiki S.Prakash Rao - Pulse Digital and Switching Waveforms –2nd Ed., TMH, 2008.
3. Millman, C Chalkias, "Integrated Electronics", 4th Edition, McGraw Hill Education (India) Private Ltd., 2015.

References:

1. Behzad Razavi, "Fundamentals of Micro Electronics", Wiley, 2010.
2. Donald A Neamen, "Electronic Circuits –Analysis and Design," 3rdEdition, McGraw Hill (India), 2019.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 9th Edition, Pearson/Prentice Hall, 2006.

Mapping of Course Outcomes with Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**2**	**3**		**1**	**3**								**3**
CO2	**3**	**3**		**2**	**3**								**3**
CO3	**3**	**3**		**3**	**3**								**3**
CO4	**2**	**3**		**1**	**2**								**3**
CO5	**3**	**3**		**3**	**3**								**3**

Correlation matrix

Unit No.	CO					Program Outcome (PO)	PO(s) :Action Verb and BTL(for PO1 to PO11)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	Correlation	CO's Action verb	BTL			
1	15	22	3	Understand	L2	PO1, PO2, PO4, PO5	PO1: Apply (L3) PO2: Review (L2) PO4: Analyze(L4) PO5: Select(L1)	2 3 1 3
2	14	20	2	Apply	L3	PO1, PO2, PO4, PO5	PO1: Apply (L3) PO2: Review (L2) PO4: Analyze-L4 PO5: Apply (L3)	3 3 2 3
3	14	20	2	Evaluate	L5	PO1, PO2, PO4, PO5	PO1: Apply (L3) PO2: Identify(L3) PO4: Analyze(L4) PO5: Apply (L3)	3 3 3 3
4	12	18	2	Understand	L2	PO1, PO2, PO4, PO5	PO1: Apply (L3) PO2: Review (L2) PO4: Analyze(L4) PO5: Apply (L3)	2 3 1 2
5	14	20	2	Analyze	L4	PO1, PO2, PO4, PO5	PO1: Apply (L3) PO2: Identify(L3) PO4: Analyze(L4) PO5: Apply (L3)	3 3 3 3
	69	**100 %**						

Justification Statements:

CO1: Understand the multi stage amplifiers and differential amplifiers using BJT and MOSFET
Action Verb: Understand (L2)

PO1 Verbs: Apply (L3)

CO1 Action Verb is less than PO1 verb by one level; Therefore, the correlation is moderate (2).

PO2 Verbs: Review (L2)

CO1 Action Verb is in the same level of PO2 verb; Therefore, the correlation is high (3).

PO4 Verbs: Analyze(L4)

CO1 Action Verb is less than PO4 verb by two levels; Therefore, the correlation is low (1).

PO5 Verbs: Select(L1)

CO1 Action Verb is greater than PO5 verb; Therefore, the correlation is high (3).

CO2: Apply the hybrid π model for amplifiers using BJT and MOSFET at high frequencies
Action Verb: Apply (L3)
PO1 Verbs: Apply (L3)
CO2 Action Verb is same as PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Review (L2)
CO2 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO4 Verbs: Analyze (L4)
CO2 Action Verb is less than PO4 verb by one level; Therefore, the correlation is moderate (2).
PO5 Verbs: Apply (L3)
CO2 Action Verb is same as PO5 verb; Therefore, the correlation is high (3).

CO3: Evaluate the parameters of four feedback amplifiers and frequency of various oscillators.
Action Verb: Evaluate (L5)
PO1 Verbs: Apply (L3)
CO3 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verb: Identify (L3)
CO3 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO4 Verbs: Analyze(L4)
CO3 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).
PO5 Verbs: Apply (L3)
CO3 Action Verb is greater than PO5 verb; Therefore, the correlation is high (3).
CO4: Understand the principle of operation of different power amplifiers using BJT and MOSFET.
Action Verb: Understand(L2)
PO1 Verbs: Apply (L3)
CO4 Action Verb is less than PO1 verb by one level; Therefore, the correlation is moderate (2).
PO2 Verbs: Review (L2)
CO4 Action Verb is in the same level of PO2 verb; Therefore, the correlation is high (3).
PO4 Verb: Analysis (L4)
CO4 Action Verb level is less than PO4 verb by two levels; Therefore, the correlation is low (1).
PO5 Verbs: Apply (L3)
CO4 Action Verb is less than PO5 verb by one level; Therefore, correlation is moderate (2).
CO5: Analyze the operation of three types of tuned amplifiers, multivibrators and Schmitt trigger.

Action Verb: Analyse (L4)
PO1 Verb: Apply (L3)
CO5 Action verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verb: Identify (L3)
CO5 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO4 verb: Analyze (L4)
CO5 Action verb is same as PO4 verb; Therefore, the correlation is high (3).
PO5 Verbs: Apply (L3)
CO5 Action Verb is greater than PO5 verb; Therefore, the correlation is high (3).

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ELECTRONICS COMMUNICATION AND ENGINEERING (ECE)

Course Code	Year & Sem		L	T/CLC	P	C
23APC0407	II-II	Analog and Digital Communications	3	1	0	3

Course Outcomes: After studying the course, Student will be able to:

CO1: Understand the basic concepts of Communication systems and different Modulation techniques

CO2: Analyze various methods of Angle modulation and Demodulation techniques in Communication techniques.

CO3:Analyze Various types of AM, FM Transmitters and Radio receivers.

CO4: Understand the types of Noise and different Pulse Modulation methods in Communication systems

CO5: Apply Digital Modulation techniques for Pass band Data Transmission.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	the basic concepts of communication systems and different modulation techniques			L2
CO2	Analyze	Various methods of angle modulation and demodulation techniques in communication techniques			L4
CO3	Analyze	Various types of AM, FM transmitters and radio receivers			L4
CO4	Understand	The types of noise and different pulse modulation methods in communication systems			L2
CO5	Apply	digital modulation techniques for pass band data transmission			L3

UNIT I

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

UNIT II

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

UNIT III

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters

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

UNIT IV

Introduction to Noise: Types of Noise, Receiver Model, Noise in AM, DSB, SSB, and FM Receivers.

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, Delta Modulation, DPCM, Noise in PCM and DM.

UNIT V

Digital Modulation Techniques: Coherent Digital Modulation Schemes – ASK, BPSK, BFSK, QPSK, Non-coherent

BFSK, DPSK. M-array Modulation Techniques, Power Spectra, Bandwidth Efficiency. QASK, applications of Digital Modulation techniques.
Base band Transmission and Optimal Reception of Digital Signal: A Base band Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

Text books:

1. Simon Haykin, "Communication Systems",JohnWiley&Sons,4thEdition, 2004.
2. Wayne Tomasi -Electronics Communication Systems -Fundamentals through Advanced, 5thEd., PHI, 2009
3.B.P.Lathi,ZhiDing "Modern Digital and Analog Communication Systems",Oxford press, 2011

References:

1. Sam Shanmugam,"Digital and Analog Communication Systems",John Wiley & Sons, 1999.
2. BernardSklar,F.J.harris "Digial Communications: Fundamentals and Applications", Pearson Publications, 2020.
3. Tauband Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2007.
4. Dr.Sanjay Sharma, "Digital Communications", S.K Kataria &Sons, 2015.

ADC AK23

Unit No.	Topics to be deleted	Topics to be included	% of Topics to be deleted	% of Topics to be included
Unit 5	M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency	**QASK, applications of Digital Modulation techniques**	**2%**	**2%**
		Total	**2%**	**2%**

Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	**2**	**2**										**2**	
2	**3**	**3**										**2**	
3	**3**	**3**										**3**	
4	**2**	**2**										**2**	
5	**3**	**3**										**3**	

Correlation matrix:

Unit No.	CO					Program Outcome (PO)	PO(s): Action Verb and BTL (for PO1 to PO11)	Level of Correlation (0-3)
	Lesson plan (Hrs)	%	Correlation	Co's Action verb	BTL			
1	12	16	2	Understand	L2	PO1,PO2	PO1: Apply(L3) PO2:Identify (L3)	2 2
2	10	16	2	Analyze	L4	PO1, PO2	PO1: Apply (L3) PO2: Identify (L3)	3 3
3	15	23	3	Analyze	L4	PO1, PO2	PO1: Apply(L3) PO2: Identify(L3)	3 3
4	14	22	3	Understand	L2	PO1, PO2	PO1: Apply(L3) PO2: Identify(L3)	2 2
5	14	22	3	Apply	L3	PO1, PO2	PO1: Apply(L3) PO2: Identify (L3)	3 3
	65							

Justification Statements:

CO1: Understand the basic concepts of communication systems and different modulation techniques
Action Verb: Understand (L2)

PO1 Verbs: Apply (L3) CO1 Action Verb is less than to PO1 verb; Therefore, correlation is moderate (2).
PO2 Verbs: Identify (L3) CO1 Action Verb is less than to PO2 verb; Therefore, correlation is moderate (2).
CO2: Analyze Various methods of angle modulation and demodulation techniques in communication techniques
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3) CO2 Action Verb is greater to PO1 verb; Therefore, correlation is high (3).
PO2 Verbs: Identify (L3) CO2 Action Verb is greater to PO2 verb; Therefore, correlation is high (3).
CO3:Analyze Various types of AM, FM transmitters and radio receivers.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3) CO3 Action Verb is greater to PO1 verb; Therefore, correlation is high (3).
PO2 Verb: Identify (L3) CO3 Action Verb is greater to PO2 verb; Therefore, correlation is high (3).
CO4: Understand The types of noise and different pulse modulation methods in communication systems.
Action Verb: Understand (L2)
PO1 Verbs: Apply (L3) CO4 Action Verb is less than to PO1 verb; Therefore, correlation is moderate (2).
PO2 Verbs: Identify (L3) CO4 Action Verb is less than to PO2 verb; Therefore, correlation is moderate (2).
CO5: Apply digital modulation techniques for pass band data transmission.
Action Verb: Apply (L3)
PO1 Verbs: Apply (L3) CO5 Action Verb is equal to PO1 verb; Therefore, correlation is high (3).
PO2 Verb: Identify (L3) CO5 Action Verb is equal to PO2 verb; Therefore, correlation is high (3).

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Course Code	Year & Sem		L	T	P	C
23APC0408	II-II	Electronic Circuits Analysis Lab	0	0	3	1.5

Course Outcomes: After studying the course, Student will be able to:

CO1 **Analyze** the frequency response of Multistage Amplifier and Differential Amplifier.
CO2 **Evaluate** the parameters of Feedback Amplifiers with and without negative feedback.
CO3 **Analyze** the steps in the design of Oscillators using RC and LC as feedback elements.
CO4 **Evaluate** the % efficiency and frequency response of Class-A and Class-AB Power Amplifiers.
CO5 **Evaluate** the performance of Tuned amplifier, Multivibrators and Schmitt Trigger using BJT.

	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Analyze	the frequency response of Multistage Amplifier and Differential Amplifier			L4
CO2	Evaluate	the parameters of Feedback Amplifiers	with and without negative feedback.		L5
CO3	Analyze	the steps in the design of Oscillators	using RC and LC as feedback elements.		L5
CO4	Evaluate	the % efficiency and frequency response of Class-A and Class-AB Power Amplifiers			L4
CO5	Evaluate	performance of Tuned amplifier, Multivibrators and Schmitt Trigger	using BJT		L4

List of Experiments:

1. Design and Analysis of Darlington pair. (CO1)
2. Frequency response of CE– CC multistage Amplifier. (CO1)
3. Design and Analysis of Cascode Amplifier. (CO1)
4. Frequency Response of Differential Amplifier (CO1).
5. Design and Analysis of any two topologies of feedback amplifies and find the frequency response of it.(CO2)
6. Design and Analysis of RC phase shift oscillators. (CO3)
7. Design and Analysis of LC Oscillators. (CO3)
8. Design and Analysis of Class-A power amplifier. (CO4)
9. Design and Analysis of Class-AB amplifier. (CO4)
10. Frequency Response of Single Tuned amplifier. (CO5)
11. Design a Bistable Multivibrator and analyze the effect of commutating capacitors and draw the wave forms at base and collector of transistors. (CO5)
12. Design an Astable Multivibrator and draw the waveforms at base and collector of transistors. (CO5)
13. Design a Monostable Multivibrator and draw the input and output waveforms. (CO5)
14. Draw the response of Schmitt trigger for gain of greater than and less than one. (CO5)

Note: At least 12 experiments shall be performed.

Faculty members who are handling the laboratory shall see that students are given design specifications for a given circuit appropriately and monitor the design and analysis aspects of the circuit.

Mapping of Course Outcomes with Program Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	3									3
CO2	3	3	2	3									3
CO3	3	3	1	3									3
CO4	3	3	2	2									3
CO5	3	3	2	3									3

Correlation matrix

Expt. No.	CO					Program Outcome (PO)	PO(s): Action Verb and BTL (for PO1 to PO11)	Level of Correlation (0-3)
	Lesson Plan (Hrs.)	%	Correlation	CO's Action verb	BTL			
1,2,3,4	**12**	**29**	2	Analyze	**L4**	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Design(L6) PO4: Analyze(L4)	3 3 1 3
5	**3**	**7**	3	Evaluate	**L5**	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Design(L6) PO4: Analyze(L4)	3 3 2 3
6,7	**6**	**14**	**3**	Analyze	**L4**	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Design(L6) PO4: Analyze(L4)	3 3 1 3
8,9	**6**	**14**	**3**	Evaluate	**L5**	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Design(L6) PO4: Analyze(L4)	3 3 2 3
10,11, 12,13,14	**15**	**36**	**2**	Evaluate	**L5**	PO1, PO2, PO3, PO4	PO1: Apply (L3) PO2: Review (L2) PO3: Design(L6) PO4: Analyze(L4)	3 3 2 3
	42	**100%**						

Justification Statements:

CO1: Analyze the frequency response of Multistage Amplifier and Differential Amplifier.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO1 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Review (L2)
CO1 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO3 Verbs: Design (L6)
CO1 Action Verb is less than PO3 verb by two levels; Therefore, the correlation is low (1).
PO4 Verbs: Analyze (L4)
CO1 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

CO2: Evaluate the parameters of Feedback Amplifiers with and without negative feedback.
Action Verb: Evaluate (L5)
PO1 Verbs: Apply (L3)
CO2 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Review (L2)
CO2 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO3 Verbs: Design (L6)
CO2 Action Verb is less than PO3 verb by one level; Therefore, the correlation is moderate (2).
PO4 Verbs: Analyze (L4)
CO2 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

CO3: Analyze the steps in the design of Oscillators using RC and LC as feedback elements.
Action Verb: Analyze (L4)
PO1 Verbs: Apply (L3)
CO3 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).
PO2 Verbs: Review (L2)
CO3 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).
PO3 Verbs: Design (L6)
CO3 Action Verb is less than PO3 verb by two levels; Therefore, the correlation is low (1).
PO4 Verbs: Analyze (L4)
CO3 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

CO4: Evaluate the % efficiency and frequency response of Class-A and Class-AB Power Amplifiers.
Action Verb: Evaluate (L5)

PO1 Verbs: Apply (L3)

CO4 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).

PO2 Verbs: Review (L2)

CO4 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).

PO3 Verbs: Design (L6)

CO4 Action Verb is less than PO3 verb by one level; Therefore, the correlation is moderate (2).

PO4 Verbs: Analyze (L4)

CO4 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

CO5: Evaluate the performance of Tuned amplifier, Multivibrators and Schmitt Trigger using BJT.
Action Verb: Evaluate (L5)

PO1 Verbs: Apply (L3)

CO5 Action Verb is greater than PO1 verb; Therefore, the correlation is high (3).

PO2 Verbs: Review (L2)

CO5 Action Verb is greater than PO2 verb; Therefore, the correlation is high (3).

PO3 Verbs: Design (L6)

CO5 Action Verb is less than PO3 verb by one level; Therefore, the correlation is moderate (2).

PO4 Verbs: Analyze (L4)

CO5 Action Verb is greater than PO4 verb; Therefore, the correlation is high (3).

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Course Code	Year &Sem		L	T	P	C
23APC0409	II-II	Analog and Digital Communication systems Lab	0	0	3	1.5

Course Outcomes: After studying the course student will be able to

CO1: Analyze the Analog modulation and demodulation methods in time domain.
CO2: Evaluate the performance of various analog pulse modulation schemes.
CO3: Analyze the process of transmission and reception of signals using Time division multiplexing.
CO4: Analyze the Performance of Delta modulation and demodulation also PCM systems.
CO5: Analyze the Performance of Pass Band Data Transmission Systems.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO 1	**Analyze**	The analog Modulation and demodulation methods in time domain			**L4**
CO 2	**Evaluate**	The performance of various analog pulse modulation schemes			**L5**
CO 3	**Analyze**	The process of transmission and reception of signals using time domain multiplexing			**L4**
CO 4	**Analyze**	The performance of delta modulation and demodulation also PCM systems			**L4**
CO 5	**Analyze**	The performance of pass band data transmission systems			**L4**

List of Experiments:

Design the circuits and verify the following experiments taking minimum of six from each section shown below.
Section-A

1. AM Modulation and Demodulation
2. DSB-SC Modulation and Demodulation
3. Frequency Division Multiplexing
4. FM Modulation and Demodulation
5. Radio receiver measurements
6. PAM Modulation and Demodulation
7. PWM Modulation and Demodulation
8. PPM Modulation and Demodulation

Section-B

1. Sampling Theorem.
2. Time Division Multiplexing
3. Delta Modulation and Demodulation
4. PCM Modulation and Demodulation
5. BPSK Modulation and Demodulation
6. BFSK Modulation and Demodulation
7. QPSK Modulation and Demodulation
8. DPSK Modulation and Demodulation

Note: Faculty members (who are handling the laboratory) are requested to instruct the students not to use ready made kits for conducting the experiments. They are advised to make the students work in the laboratory by constructing the circuits and analyzing them during the lab sessions.

Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1	**3**	**3**	**1**	**3**								**3**	**2**
2	**3**	**3**	**2**	**3**								**2**	**2**
3	**3**	**3**	**1**	**3**								**3**	**3**
4	**3**	**3**	**1**	**3**								**3**	**3**
5	**3**	**3**	**1**	**3**								**3**	**2**

Correlation matrix:

Exp. No	CO					Program Outcome (PO)	PO(s) :Action Verb and BTL(for PO1 to PO11)	Level of Correlation (0-3)
	Lesson plan(Hrs)	%	Correlation	Co's Action verb	BTL			
1,2,3,4, 5	15	32	3	Analyze	L4	PO1,PO2, PO3, PO4	PO1: Apply(L3) PO2:Identify (L3) PO3: Design(L6) PO4: Analyze(L4)	3 3 1 3
6,7,8	9	18	3	Evaluate	L5	PO1,PO2, PO3, PO4	PO1: Apply (L3) PO2: Identify (L3) PO3: Design(L6) PO4: Analyze(L4)	3 3 2 3
B 1,2	6	12	3	Analyze	L4	PO1,PO2, PO3, PO4	PO1: Apply(L3) PO2:Identify (L3) PO3: Design(L6) PO4: Analyze(L4)	3 3 1 3
3,4	6	12	3	Analyze	L4	PO1,PO2, PO3, PO4	PO1: Apply(L3) PO2:Identify (L3) PO3: Design(L6) PO4: Analyze(L4)	3 3 1 3
5,6,7,8	12	26	3	Analyze	L4	PO1,PO2, PO3, PO4	PO1: Apply(L3) PO2:Identify (L3) PO3: Design(L6) PO4: Analyze(L4)	3 3 1 3
	48	**100 %**						

Justification Statements:

CO1: Analyze the Analog modulation and demodulation methods in time domain

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3) CO1 Action Verb is greater than to PO1 verb; Therefore correlation is high (3).
PO2 Verbs: Identify (L3) CO1 Action Verb is greater than to PO2 verb; Therefore correlation is high (3).
PO3 Verbs: Design (L6) CO1 Action verb is two less than to PO3 verb; Therefore Correlation is low (1).
PO4 verbs: Analyze(L4) CO1 Action verb is equal to PO4 verb; Therefore correlation is high(3)

CO2: Evaluate the performance of various analog pulse modulation schemes.

Action Verb: Evaluate (L5)

PO1 Verbs: Apply (L3) CO2 Action Verb is greater than to PO1 verb; Therefore correlation is high (3).
PO2 Verbs: Identify (L3) CO2 Action Verb is greater than to PO2 verb; Therefore correlation is high (3).
PO3 Verbs: Design (L6) CO2 Action verb is one less than to PO3 verb; Therefore Correlation is moderate (2).
PO4 verbs: Analyze(L4) CO2 Action verb is greater to PO4 verb; Therefore correlation is high(3)

CO3: Analyze the process of transmission and reception of signals using Time division multiplexing.

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3) CO3 Action Verb is greater than to PO1 verb; Therefore correlation is high (3).
PO2 Verbs: Identify (L3) CO3 Action Verb is greater than to PO2 verb; Therefore correlation is high (3).
PO3 Verbs: Design (L6) CO3 Action verb is two less than to PO3 verb; Therefore Correlation is low (1).
PO4 verbs: Analyze(L4) CO3 Action verb is equal to PO4 verb; Therefore correlation is high(3)

CO4: Analyze the Performance of Delta modulation and demodulation also PCM systems.

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3) CO4 Action Verb is greater than to PO1 verb; Therefore correlation is high (3).
PO2 Verbs: Identify (L3) CO4 Action Verb is greater than to PO2 verb; Therefore correlation is high (3).
PO3 Verbs: Design (L6) CO4 Action verb is two less than to PO3 verb; Therefore Correlation is low (1).
PO4 verbs: Analyze(L4) CO4 Action verb is equal to PO4 verb; Therefore correlation is high(3)

CO5: Analyze the Performance of Pass Band Data Transmission Systems.

Action Verb: Analyze (L4)

PO1 Verbs: Apply (L3) CO5 Action Verb is greater than to PO1 verb; Therefore correlation is high (3).
PO2 Verbs: Identify (L3) CO5 Action Verb is greater than to PO2 verb; Therefore correlation is high (3).
PO3 Verbs: Design (L6) CO5 Action verb is two less than to PO3 verb; Therefore Correlation is low (1).
PO4 verbs: Analyze(L4) CO5 Action verb is equal to PO4 verb; Therefore correlation is high(3)

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(Autonomous)
AK23 Regulations

Year: II B.Tech **(Common to all branches)** **Semester: II**

Subject Code **23ASC9901**	Subject Name **SOFT SKILLS LAB**	**L T P** **0 1 2**	**Credit: 2**

Course Outcomes (CO): Student will be able to
CO1: Understand the various techniques of soft skills and communication skills.
CO2: Analyze the listening and thinking skills to enhance professional development.
CO3: Apply theoretical thinking skills in problem solving and decision making through Discussions .
CO4: Evaluate the emotional intelligence and stress management for individuals and groups.
CO5: Apply the corporate etiquette atmosphere to enhance professional behaviour in workplace environment.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Bloom s level
1	Understand	the various techniques of soft skills and communication skills.			**L2**
2	Analyze	the listening and thinking skills to enhance professional development.			**L4**
3	Apply	The critical thinking skills in problem solving and decision making through Discussions .			**L3**
4	Evaluate	The emotional intelligence and stress management to control in themselves and others.			**L5**
5	Apply	the corporate etiquette atmosphere to enhance processional behavior in workplace environment.			**L3**

UNIT I Soft Skills & Communication Skills

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills -Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity.

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non-verbal clues and remedy the lapses on observation.

UNIT II Critical Thinking

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT III Problem Solving & Decision Making

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.

Case Study & Group Discussion

UNIT IV Emotional Intelligence & Stress Management

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT V Corporate Etiquette

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips -Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

Prescribed Books:

1. MitraBarun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr ShikhaKapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018

Reference Books:

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K, Soft Skills S.Chand& Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan&Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Soft Skills for a Big Impact (English, Paperback, RenuShorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

Correlation of COs with the POs & PSOs for B.Tech

AK-23 Regulations

***3: Highly Correlated, 2: Moderately Correlated, 1: Weakly Correlated**

Course Title	Course Outcomes COs	Programme Outcomes(POs)											
		PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
Soft Skills Lab	CO1									2				
	CO2								3	3				
	CO3								2					
	CO4								3					
	CO5								2	2				

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO6to PO11)	Level of Correlation (0-3)
	(Approx. Hrs)	%	corr	Verb	BTL			
1			CO1	UNDERSTAND	L2	PO9	Thumb rule	2
2			CO2	ANALYZE	L4	PO8, PO9	Thumb rule	3,3
3			CO3	APPLY	L3	PO8	Thumb rule	2
4			CO4	EVALUATE	L5	PO8	Thumb rule	3
5			CO5	Apply	L3	PO8, PO9	Thumb rule	2,2

Justification Statements:

CO1: Understand the various techniques of soft skills and communication skills.

Action Verb: Understand (L2)

CO1 Action Verb Understand is of BTL 2. Using Thumb rule, L2 correlates PO6 to PO11 as moderate (2).

CO2: Analyze the listening and thinking skills to enhance professional development.

Action Verb: Analyze **(L4)**

CO2 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 to PO11 as high (3)

CO3: Apply the critical thinking skills in problem solving and decision making through Discussions .

Action Verb: Apply (L3)

CO3 Action Verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 to PO11 as moderate (2).

CO4: Evaluate the emotional intelligence and stress management to control themselves and others.

Action Verb: Evaluate **(L5)**

CO4 Action Verb Evaluate is of BTL 5. Using Thumb rule, L2 correlates PO6 to PO11 as high(3).

CO5: Apply the corporate etiquette atmosphere to enhance processional behavior in workplace environment.

Action Verb: Create e (L3)

CO5 Action Verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 to PO11 as moderate (2).

Annamacharya Institute of Technology & Sciences :: Tirupati
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AK23 Regulations

Year: II **Semester: II** **Branch of Study: Common to all**

Subject Code	Subject Name	L	T	P	Credits
23AES0304	Design Thinking & Innovation	1	0	2	2

Course Outcomes:

CO: 1 Understand the concepts and principles of design thinking process.

CO: 2 Apply the design thinking techniques for solving problems in various sectors.

CO: 3 Analyze the art of innovation & creativity in product development.

CO: 4 Apply the design guidelines for produced development.

CO: 5 Analyze the design thinking strategies for solving real time business issues.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	the concepts and principles of design thinking process.			L1
CO2	Apply	the design thinking techniques for solving problems in various sectors.			L3
CO3	Analyze	the art of innovation & creativity in product development.			L4
CO4	Apply	the design guidelines for produced development.			L3
CO5	Analyze	the design thinking strategies for solving real time business issues.			L4

Unit I:

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

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

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

Unit V

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.

Text Books:

1. TimBrown, Change by design, Harper Bollins(2009)
2. IdrisMootee, Design Thinking for Strateg ic Innovation, 2013,JohnWiley&Sons.

Reference Books:

1. DavidLee, Design Thinking in the Classroom, Ulysses press
2. ShrutinN Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design-Kritinaholden,JillButter.
4. Chesbrough.H,TheEraofOpenInnovation–2013

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

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Understand	the concepts and principles of design thinking process.			L1
CO2	Apply	the design thinking techniques for solving problems in various sectors.			L3
CO3	Analyze	the art of innovation & creativity in product development.			L4
CO4	Apply	the design guidelines for produced development.			L3
CO5	Analyze	the design thinking strategies for solving real time business issues.			L4

Course Title	COs	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO1	PSO2
Design Thinking & Innovation	**CO1**	2		2									2	2
	CO2	2	2	2									2	2
	CO3	2	2	2			1						2	2
	CO4	2	2	2			1						2	2
	CO5	2	2	2			2						2	2

Correlation matrix

CO	Percentage of contact hours over the total planned contact hours			CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	correlation	Verb	BTL			
1	**11**	**20.3**	**L3**	**Understand**	**L2**	PO1 PO3	Apply (L3) Develop (L3)	2 2
2	**10**	**18.5**	**L2**	**Apply**	**L3**	PO1 PO2 PO3	Apply (L3) Identify (L3) Develop (L3)	3 3 3
3	**11**	**20.3**	**L3**	**Analyze**	**L4**	PO1 PO2	Apply (L3) Identify (L3)	3 3

						PO3 PO6	Develop (L3) Thumb Rule	3 1
4	**12**	**22.2**	**L3**	**Apply**	**L3**	PO1 PO2 PO3 PO6	Apply (L3) Identify (L3) Develop (L3) Thumb Rule	3 3 3 1
5	**10**	**18.5**	**L2**	**Analyze**	**L4**	PO1 PO2 PO3 PO6	Apply (L3) Identify (L3) Develop (L3) Thumb Rule	3 3 3 2
Total	**54**	**100**						

Justification Statements:

CO1: Understand the concepts and principles of design thinking process.

Action Verb: Understand (L2)

PO1Verb: **Apply (L3)**

CO1 Action verb is lower than PO1 verb. Therefore, the correlation is medium (2)

PO3 Verb: **Develop (L3)**

CO1 Action verb is lower than PO3 verb. Therefore, the correlation is medium (2)

CO2: Apply the design thinking techniques for solving problems in various sectors.

PO1Verb: **Apply (L3)**

CO2 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Identify (L3)**

CO2 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop (L3)**

CO2 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)

CO3: Analyze the art of innovation & creativity in product development.

Action Verb: **Analyze** (L4)

PO1Verb: **Apply (L3)**

CO3 Action verb is same level (greater) as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Identify (L3)**

CO3 Action verb is same level (greater) as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop (L3)**

CO3 Action verb is same level (greater) as PO3 verb. Therefore, the correlation is high (3)

PO6 Verb: Thumb Rule

As per thumb rule CO3 co-relates slightly with PO6 verb. Therefore, the correlation is high (3)

CO4: Apply the design guidelines for produced development.

Action Verb: Apply (L3)

PO1Verb: **Apply (L3)**

CO4 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Identify (L3)**

CO4 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop (L3)**

CO4 Action verb is same level as PO3 verb. Therefore, the correlation is high (3)

PO6 Verb: Thumb Rule

As per thumb rule CO4co-relates slightly with PO6 verb. Therefore, the correlation is high (3)

CO5: Analyze the design thinking strategies for solving real time business issues.

Action Verb: Analyze (L4)

PO1Verb: **Apply (L3)**

CO5 Action verb is same level (greater) as PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Identify (L3)**

CO5 Action verb is same level (greater) as PO2 verb. Therefore, the correlation is high (3)

PO3 Verb: **Develop (L3)**

CO5 Action verb is same level (greater) as PO3 verb. Therefore, the correlation is low (1)

PO6 Verb: Thumb Rule

As per thumb rule

CO5 co-relates moderately with PO6 verb. Therefore, the correlation is high (3)

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Year: II B.Tech Semester: II AK 23 Regulations Branch: Common to All

Subject Code	Subject Name	L	T	P	Credits
23AMC9901	Environmental Science	2	0	0	0

Course Outcomes (CO): Student will be able to

1. Understand the multidisciplinary nature of environmental studies and various renewable and non renewable resources.
2. Understand the ecosystem and biodiversity to solve complex environmental problems
3. Apply various types of pollution and solid waste management and related preventive measures
4. Apply rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
5. Understand the population explosion

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
1	**Understand**	Multidisciplinary nature of environmental studies and various renewable and nonrenewable resources			**L2**
2	**Understand**	Ecosystem and biodiversity to solve complex environmental problems			**L2**
3	**Apply**	Various types of pollution and solid waste management and related preventive measures			**L3**
4	**Apply**	Rainwater harvesting, watershed management, ozone layer depletion and wasteland reclamation			**L3**
5	**Understand**	Population explosion			**L2**

UNIT – I **(10Hr)**

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

Natural Resources: Renewable and non-renewable energy 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 sub-surface – 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-pesticides problems, water logging, salinity, case studies.

Energy resources: Renewable and non-renewable energy resources.

UNIT – II **(15Hr)**

Ecosystems: Concept of an ecosystem. – Structure and functions 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: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Biodiversity And Its Conservation : Introduction- Definition: genetic, species and ecosystem diversity – 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 – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III **(8Hr)**

Environmental Pollution: Definition, Causes, effects and its control measures of: Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, and Thermal pollution and 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, Tsunami and landslides.

UNIT – IV **(9Hr)**

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– 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 – Public awareness.

UNIT – V **(8Hr)**

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – 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.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

REFERENCES:

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

Mapping of COs to POs and PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
1						2	2						
2							2						
3						2	2						
4						2	2						
5							2						

(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)

CO-PO mapping justification:

CO	Percentage of contact hours over the total planned contact hours				CO		Program Outcome (PO)	PO(s): Action verb and BTL (for PO1 to PO5)	Level of Correlation (0-3)
	Register (Hrs)	Lesson Plan (Hrs)	%	corr	Verb	BTL			
1	10	12	23	3	Understand	L2	PO6,PO7	PO6: PO7:	2,2
2	15	15	28	3	Understand	L2	PO7	PO7:	2,2
3	8	8	15	2	Apply	L3	PO6 PO7	PO6: PO7:	2,2
4	9	10	19	2	Apply	L3	PO6,PO7	PO6: PO7:	2,2
5	8	8	15	2	Understand	L2	PO7	PO7:	2,2
	50	53	100						

CO1: Understand the multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.

Action Verb: Understand (L2)

CO1 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

CO2: Understand the ecosystem and biodiversity to solve complex environmental problems

Action Verb: Understand (L2)

CO2 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

CO3: Apply various types of pollution and solid waste management and related preventive measures

Action Verb: APPLY (L3)

CO3 Action Verb is **APPLY** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

CO4: Apply rainwater harvesting, watershed management, ozone layer depletion and wasteland reclamation.

Action Verb: APPLY (L3)

CO4 Action Verb is **APPLY** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)

CO5: Understand the population explosion

Action Verb: Understand (L2)

CO5 Action Verb is **Understand** of BTL 2.Using Thumb rule; L2 correlates PO6 and PO7 as a moderate (2)