ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

INDUCTION PROGRAMME

S.No	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation,Plantation	MC	0-0-6-0
2	Career Counseling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools,etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs,tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematicalskills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking,Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

B.Tech. – I Year I Semester

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T	P	C			
1	BS	23ABS9903	Engineering Physics	3	0	0	3	30	70	100
2	BS	23ABS9904	Linear Algebra & Calculus	3	0	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	3	0	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	-	-	1	0.5	50	-	50
			Total	**13**	**00**	**15**	**20.5**	**320**	**630**	**950**

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Course Code	**ENGINEERING PHYSICS**	L	T	P	C
23ABS9903		**3**	**0**	**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 nanomaterials 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 byLaue'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 effect and its applications – Applications of semiconductors.

Textbooks:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy, 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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
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CIVIL ENGINEERING (CE)

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							

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
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CIVIL ENGINEERING (CE)

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).

AK23 Regulations

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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CIVIL ENGINEERING (CE)

Year : I **Semester** : I **Branch of Study :** Common to All

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

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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 (by double 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, Pearsonpublishers, 2018, 5 th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearsonpublishers, 9 th edition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Mapping of COs to POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
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

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 toPO2 verb ; 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 AND SCIENCES, TIRUPATI
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CIVIL ENGINEERING (CE)

Year : I **Semester** : I **Branch of Study :** Common to All

Subject Code: 23AES0201	Subject Name: BASIC ELECTRICAL & ELECTRONICS ENGINEERING	L T P	Credits
		3 0 0	3

PART-A

COURSE OUTCOMES:

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
1	Understand	The fundamentals laws of A. C circuits and D. C circuits.		A. C circuits and D. C circuits	L2
2	Understand	Operating principles of motors, generators and measuring instruments.			L2
3	Understand	The fundamentals of Power generation, costing and safety measures.			L2

SYLLABUS:

PART-A

BASIC ELECTRICAL ENGINEERING

UNIT I: DC & AC Circuits

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

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

UNIT II: Machines and Measuring Instruments

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

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

UNIT III: Energy Resources, Electricity Bill & Safety Measures

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

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

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

TEXTBOOKS:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition 2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013.
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 Edition.

WEB RESOURCES:

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

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CIVIL ENGINEERING (CE)

PART-B

COURSE OUTCOMES:

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
4	Understand	fundamental concepts of diodes, transistors and its applications			L2
5	Analyze	concepts of rectifiers, power supplies and amplifiers in electronics			L4
6	Analyze	concepts of Number Systems, Boolean Functions, Logic Gates and Digital Circuits			L4

UNIT I: SEMICONDUCTOR DEVICES

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

UNIT II: **BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION**

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

Textbooks:

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

Reference Books:

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

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	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											

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	08	30	3	**Understand**	**L2**	PO1, PO2, PO6	PO1: Apply (L3) PO2: Identify (L3) PO6: Thumb Rule	2 2 1
2	08	30	3	**Understand**	**L2**	PO1, PO2, PO6	PO1: Apply (L3) PO2: Analyze(L4) PO6: Thumb Rule	2 1 1
3	10	38	3	**Understand**	**L2**	PO1, PO2, PO6	PO1: Apply (L3) PO2: Analyze(L4) PO6: Thumb Rule	2 1 2
4	08	30	3	Understand	**L2**	PO1, PO2	PO1: Apply (L3) PO2: Review (L2)	2 3
5	08	30	3	Analyze	**L4**	PO1, PO2	PO1: Apply (L3) PO2: Review (L2)	3 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).

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CIVIL ENGINEERING (CE)

Year: I **Semester: I/II** **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 anddevelopment of surfaces	of regular solids		L4
CO5	Apply	orthographic and isometric projections concepts to constructthe 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: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

Unit IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Unit V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views. **Computer graphics**: Creating 2D&3D drawings of objects including PCB and Transformationsusing Auto CAD (*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 McGraw Hill, 2013.
2. Engineering Drawing, M.B. Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Justification Statements:

CO1: Apply the concepts of engineering curves and scales for technical drawing.
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: **Develop (L3)**
CO1 Action verb is same level as PO2 verb. Therefore, the correlation is high (3)PO10 Verb: 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)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Course Code	Year & Sem	INTRODUCTION TO PROGRAMMING	L	T	P	C
23AES0501	I-I	**(Common to All branches of Engineering)**	**3**	**0**	**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**	
History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program- Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting. **Problem solving techniques:** Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.		
UNIT - II	**Control Structures**	
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do- while) Break and Continue.		
UNIT - III	**Arrays and Strings**	
Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.		
UNIT - IV	**Pointers & User Defined Data types**	
Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.		
UNIT - V	**Functions & File Handling**	
Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and 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, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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								3	2	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	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) PO11: 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 %						

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Course Code	Year & Sem	IT workshop	L	T	P	C
23AES0503	I-II	**(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 for customizing 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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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 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
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 for customizing 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: idetify(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 AND SCIENCES, TIRUPATI
(Autonomous)
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CIVIL ENGINEERING (CE)

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.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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							

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(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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).

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CIVIL ENGINEERING (CE)

Subject Code: **23AES0202**	Subject Name: **ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP**	L T P 0 0 3	Credits:1.5

COURSE OUTCOMES:

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

SYLLABUS:

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

Note: Minimum Six Experiments to be performed.

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CIVIL ENGINEERING (CE)

PART B

ELECTRONICS ENGINEERING LAB

COURSE OUTCOMES:

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

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 flip flops 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.

References:

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

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

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CIVIL ENGINEERING (CE)

Mapping of course outcomes with program outcomes

Course Title	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP	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											

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	**Apply**	**L3**	PO1, PO2, PO4, PO9	PO1: Apply (L3) PO2: Analyze(L4) PO4: Analyze(L4) PO9: Thumb Rule	3 2 2 1
3	**Design**	**L6**	PO2, PO4, PO9	PO2: Analyze(L4) PO4: Design (L6) PO9: Thumb Rule	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).
PO9: 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)
CO3 Action Verb is same as PO4 verb; 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)
CO4 Action Verb 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)
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 truth tables of all logic gates and f/f's using IC's.
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 AND SCIENCES, TIRUPATI
(Autonomous)
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CIVIL ENGINEERING (CE)

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

v) 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. 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. 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	

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	PO1: Apply(L3)	2
			PO2	PO2: Review(L2)	3
			PO3	PO3: Develop(L3)	2
			PO4	PO4: Analyze(L4)	2
2	CO2: Create	L6	PO1	PO1: Apply(L3)	3
			PO2	PO2: Review (L3)	3

			PO4	PO4: Analyze (L4)	3
			PO5	PO5: Apply(L3)	3
			PO11	PO11: Thumb rule	2
3	CO3: Apply	L3	PO1	PO1: Apply(L3)	3
			PO2	PO2: Review (L3)	3
			PO4	PO4: Analyze (L4)	2
			PO5	PO5: Apply(L3)	3
			PO11	PO11: Thumb rule	3
4	CO4: Apply	L3	PO1	PO1: Apply(L3)	3
			PO2	PO2: Review (L2)	3
			PO3	PO3: Develop(L3)	3
			PO4	PO4: Analyze (L4)	2
			PO11	PO11: Thumb rule	2
5	CO5: Create	L6	PO1	PO1: Apply(L3)	3
			PO2	PO2: Review(L2)	3
			PO3	PO3: Develop(L3)	3
			PO4	PO4: Analyze (L4)	3
			PO11	PO11: Thumb rule	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 AND SCIENCES, TIRUPATI
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CIVIL ENGINEERING (CE)

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

Subject Code	SubjectName	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:

i) Conducting –ice breaking sessions-expectations from the course-knowing personaltalents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasingroad map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societalissues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution

UNIT-II

Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organizing Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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CIVIL ENGINEERING (CE)

UNIT-III

Community Service
Activities:

i) 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.
ii) Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and PopulationEducation.
v) Any other programmes in collaboration with local charities, NGOs etc.
vi) 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 3 3
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

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(Autonomous)
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CIVIL ENGINEERING (CE)

B.Tech. – I Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	CIE	SEE	Total
				L	T	P	C			
1	HM	23AHM9901	Communicative English	2	0	0	2	30	70	100
2	BS	23ABS9902	Engineering Chemistry	3	0	0	3	30	70	100
3	BS	23ABS9905	Differential Equations &Vector Calculus	3	0	0	3	30	70	100
4	ES	23AES0101	Basic Civil& Mechanical Engineering	3	0	0	3	30	70	100
5	PC	23APC0101	Engineering Mechanics	3	0	0	3	30	70	100
6	HM	23AHM9902	Communicative English Lab	0	0	2	1	30	70	100
7	BS	23ABS9907	Engineering Chemistry Lab	0	0	2	1	30	70	100
8	ES	23AES0302	Engineering Workshop	0	0	3	1.5	30	70	100
9	PC	23APC0102	Engineering Mechanics & Building Practices Lab	0	0	3	1.5	30	70	100
10	HM	23AHM9903	Health and wellness, Yoga and Sports	-	-	1	0.5	50	-	50
			Total	**14**	**0**	**11**	**19.5**	**320**	**630**	**950**

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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:

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

VOCABULARY

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

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	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
Communicative English	CO1										2	
	CO2									2	2	
	CO3										3	
	CO4										3	
	CO5										3	

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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	PO10	Thumb Rule	2
2	12	22	3	Apply	L3	PO9,PO10	Thumb Rule	2,2
3	10	18	2	Analyze	L4	PO10	Thumb Rule	3
4	10	18	2	Analyze	L4	PO10	Thumb Rule	3
5	10	18	2	Create	L6	PO10	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).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Year: I B.Tech (Common to Civil and Mechanical Engineering) Semester: II

Subject Code:23ABS9902	**Subject Name:** Engineering Chemistry	L 3	T 0	P 0	Credits: 3	CLC 3

Course Code	**ENGINEERING CHEMISTRY**		L	T	P	C
23ABS9902			**3**	**0**	**0**	**3**
Pre-Requisites		Semester	**I**			

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

1. **Understand the purification techniques to remove hardness of water**
2. **Apply the electrochemical principles to the energy storage devices and corrosion prevention techniques**
3. **Analyze the preparation of polymers, elastomers and fuels**
4. **Analyse the properties of lubricants, Refractories, composites and cement.**
5. **Analyze the properties of colloids and nano materials**

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	**Understand**	**Purification techniques**		**to remove hardness of water**	**L2**
2	**Apply**	**electrochemical principles to the energy storage devices and corrosion prevention techniques**			**L3**
3	**Analyze**	**preparation of polymers, elastomers and fuels**			**L4**
4	**Analyze**	**properties of lubricants, Refractories, composites and cement**			**L4**
5	**Analyze**	**Properties of colloids and nano materials**			**L4**

UNIT I Water Technology

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming**,** scale and sludge, Caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

UNIT II Electrochemistry and Applications

Electrodes –electrochemical cell, Nernst equation, cell potential calculations.Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts,the principle and working of hydrogen-oxygen Fuel cell.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion**,** cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT III Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization.Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of polystyrene. PVC Nylon 6,6 and Bakelite.

Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers. **Fuels –** Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels-propane, methanol, ethanol and bio fuel-bio diesel.

UNIT IV Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications.

Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils –Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement, constituents, Setting and Hardening of cement.

UNIT V Surface Chemistry and Nanomaterials

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Longmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

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. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J.Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.

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)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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	18.4	3	Understand	L2	PO1	PO1: Apply (L3)	2
2	10	22	33.8	3	Apply	L3	PO1	PO1: Apply (L3)	3
3	10	12	18.4	3	Analyze	L4	PO2	PO2: Analyze (L4)	3
4	10	6	9.2	1	Analyze	L4	PO1	PO1: Analyze (L4)	3
5	10	13	20	3	Analyze	L4	PO2	PO2: Analyze (L4)	3

CO1: Understand the purification techniques to remove hardness of water
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 the electrochemical principles to the energy storage devices and corrosion prevention techniques
Action Verb: Apply (L3)
PO1 Verbs: Apply (L3)
CO2 Action Verb is equal to PO1 verb; Therefore correlation is high (3).

CO3: Analyze the preparation of polymers and fuels
Action Verb: Analyze (L4)
PO2 Verb: Analyze (L4)
CO3 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

CO4: Analyse the properties of lubricants, Refractories, composites and cement.
Action Verb: Analyze (L4)
PO2 Verb: Analyze (L4)
CO4 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

CO5: Analyze the Properties of colloids and nano materials
Action Verb: Analyze (L4)
PO1 Verb: Analyze (L4)
CO5 Action verb is equal to PO2 verb; therefore the correlation is high (3).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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

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

PO1 Verbs: 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).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

I YEAR I SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23AES0101	**BASIC CIVIL & MECHANICAL ENGINEERING**	**3**	**0**	**0**	**3**

Course Outcomes: Students will be able to

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.

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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CIVIL ENGINEERING (CE)

BASIC 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, Khanna Publishers, Delhi 2023. 38th Edition
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

BASIC 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 theirapplications.

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

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

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
2. A 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, Cengagelearning 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.

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CIVIL ENGINEERING (CE)

Course Title	COs	Programme Outcomes (POs) & Programme Specific Outcomes (PSOs)												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
	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 PO7	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 PO7	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 PO7	Identify-L3 Thumb Rule	2 2
6	9/30	30	3	Understand	L2	PO1 PO5 PO7	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)

PO7 Verb: **Thumb Rule**

CO1 correlates medium with PO7. 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)

PO7 Verb: **Thumb Rule**

CO3 correlates medium with PO7. 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)

PO7 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)

PO7 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)

PO7 Verb: **Thumb Rule**

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Year: I B.Tech **(Common to Civil and Mechanical Engineering)** **Semester**: II

Subject Code: 23APC0101	Subject Name: **Engineering Mechanics**	L T P 3 0 0	Credits:3

Course Outcomes: On completion of the course, the student should be able to:
CO1: Apply the concepts of system of forces and frictional forces for contact bodies
CO2: Analyze the different force systems tocalculate their resultant forces and moments.
CO3: Apply the concepts of centroid and moment of inertia for different cross-sections.
CO4: Apply the principles of work-energy and impulse-momentum of rectilinear and curvilinear motion of a particle.
CO5: Apply the principles of work-energy and impulse-momentum of rigid body motion of a particle.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
CO1	Apply	Concepts of system of forces and frictional forces	for contact bodies		L3
CO2	Analyze	To calculate their resultant forces and moments of different force systems			L4
CO3	Apply	Concepts of centroid and moment of inertia	For different cross-sections		L3
CO4	Apply	Principles of work-energy and impulse-momentum	Rectilinear and curvilinear motion For a particle		L3
CO5	Apply	Principles of work-energy and impulse-momentum	Rigid body motion For a particle		L3

UNIT I

Introduction to Engineering Mechanics– Basic Concepts. Scope and Applications
Systems of Forces: Coplanar Concurrent Forces– Components in Space–Resultant–Moment of Force and its Application –Couples and Resultant of Force Systems.
Friction: Introduction**,** limiting friction and impending motion, Coulomb'slaws of dry friction,coefficient of friction, Cone of Static friction.

UNIT II

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses. Principle of virtual work with simple examples.

UNIT III

Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures.**Centre of Gravity:** Centre of gravity of simple body (from basic principles), Centre of gravityof composite bodies, Pappus theorems.

Area Moments of Inertia: Definition– Polar Moment of Inertia, Transfer Theorem, Momentsof Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Momentsof Inertia, Mass Moment of Inertia of composite bodies.

UNIT IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

UNIT V

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

Textbooks:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw HillEducation 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , Universitypress. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age internationalpublications 2018. 4th Edition.

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw HillEducation. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press,2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc.,New Delhi, 2022, 14th Edition

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Unit No	Course Outcomes					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	3	Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
2	15	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L3) Analyze (L4) Thumb Rule	3 3 3 3
3	15	20	3	Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
4	15	20	3	Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
5	15	20	3	Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2

Justification Statements:

CO1: Apply the concepts of system of forces and frictional forces for contact bodies

Action Verb: **Apply (L3)**

PO1 Verb: **Apply (L3)**

CO1 Action verb is equal to the level of PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze (L4)**

CO1 Action verb is above the level of PO2 verb. Therefore, the correlation is medium (2)

PO6 Verb: **Thumb Rule**

CO1 correlates highly with PO6. Therefore, the correlation is high (3)

CO2: Analyze the different force systems to calculate their resultant forces and moments.

Action Verb: **Analyze (L4)**

PO1 Verb: **Apply (L3)**

CO2 Action verb is above the level of PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze(L4)**

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

PO4 Verb: **Analyze(L4)**

CO2 Action verb is above the level of PO4 verb. Therefore, the correlation is high (3)

PO6 Verb: **Thumb Rule**

CO2 correlates highly with PO6. Therefore, the correlation is high (3)

CO3: Apply the concepts of centroid and moment of inertia for different cross-sections.

Action Verb: **Apply (L3)**

PO1 Verb: **Apply (L3)**

CO3 Action verb is equal to the level of PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze (L4)**

CO3 Action verb is above the level of PO2 verb. Therefore, the correlation is medium (2)

PO6 Verb: **Thumb Rule**

CO3 correlates highly with PO6. Therefore, the correlation is high (3)

CO4: Apply the principles of work-energy and impulse-momentum of rectilinear and curvilinear motion of a particle.

Action Verb: **Apply (L3)**

PO1 Verb: **Apply (L3)**

CO4 Action verb is equal to the level of PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze (L4)**

CO4 Action verb is above the level of PO2 verb. Therefore, the correlation is medium (2)

PO6 Verb: **Thumb Rule**

CO4 correlates highly with PO6. Therefore, the correlation is high (3)

CO5: Apply the principles of work-energy and impulse-momentum of rigid body motion of a particle.

Action Verb: **Apply (L3)**

PO1 Verb: **Apply (L3)**

CO5 Action verb is equal to the level of PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze (L4)**

CO5 Action verb is above the level of PO2 verb. Therefore, the correlation is medium (2)

PO6 Verb: **Thumb Rule**

CO5 correlates highly with PO6. Therefore, the correlation is high (3)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Year: I B.Tech **(Commonto all branches)** Semester: I & 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-thedifferentaspects of the English language proficiency with emphasis On LSRW skills.
CO2: Applycommunicationskillsthroughvariouslanguagelearningactivities.
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 ofTopics:

1. Vowels&Consonants (CO3)
2. Non Verbal Communication (CO2)
3. CommunicationSkills(CO2)
4. RolePlayor ConversationalPractice (CO1,CO2)
5. E-mailWriting (CO1)
6. Just A Minute (CO1,CO2)
7. GroupDiscussions-methods&practice (CO4)
8. Debates-Methods&Practice (CO4)
9. PPTPresentations/PosterPresentation (CO2)
10. InterviewsSkills (CO5)

SuggestedSoftware:

- WaldenInfotech
- YoungIndiaFilms

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

ReferenceBooks:

1. RamanMeenakshi,Sangeeta-Sharma.*TechnicalCommunication*.OxfordPress.2018.
2. TaylorGrant:*EnglishConversationPractice*,TataMcGraw-HillEducationIndia,2016
3. Hewing's,Martin.Cambridge*AcademicEnglish*(B2).CUP,2012.
4. J.Sethi&P.V.Dhamija.*ACourse inPhoneticsandSpoken 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
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**	10	Thumb Rule	2
2				**Apply**	**L3**	9,10	Thumb Rule	2,2
3				**Analyze**	**L4**	10	Thumb Rule	3
4				**Evaluate**	**L5**	9,10	Thumb Rule	3,3
5				**Analyze**	**L4**	10	Thumb Rule	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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).

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Year: I B.Tech (Common to Civil and Mechanical Engineering) II Semester

Subject Code: 23ABS9907	**Subject Name:** Engineering Chemistry Lab	L	T	P	Credits:1
		0	0	2	

Course Objectives: Students are expected to

- To verify the fundamental concepts with experiments

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

CO1: Estimate the hardness of water.

CO2: Prepare advanced polymer materials.

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

CO4: Estimate the Iron and Calcium in cement.

CO5: Determine the physical properties like surface tension, adsorption and viscosity.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Estimate	Hardness of water			**L5**
2	Prepare	Advanced polymer Bakelite materials			**L4**
3	Measure	Strength of an acid present in secondary batteries.			**L4**
4	Estimate	Iron and Calcium in cement			**L5**
5	Determine	Physical properties like surface tension, adsorption and viscosity			**L4**

List of Experiments:

1. Determination of Hardness of a groundwater sample (CO1)
2. Estimation of Dissolved Oxygen by Winkler's method (CO3)
3. Determination of Strength of an acid in Pb-Acid battery (CO3)
4. Preparation of a polymer (Bakelite) (CO2)
5. Determination of percentage of Iron in Cement sample by colorimetry (CO4)
6. Estimation of Calcium in port land Cement (CO4)
7. Preparation of nanomaterials by precipitation method (CO5)
8. Adsorption of acetic acid by charcoal (CO4)
9. Determination of percentage Moisture content in a coal sample (CO4)
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1(CO5)
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2 (CO5)
12. Estimation of copper by Iodometry (CO3)

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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				**Estimate**	**L5**	PO4	PO4: Analyze (L5)	3
2				**Prepare**	**L4**	PO4	PO4: Analyze (L4)	3
3				**Measure**	**L4**	PO4	PO4: Analyze (L4)	3
4				**Estimate**	**L5**	PO4	PO4: Analyze (L5)	3
5				**Determine**	**L4**	PO4	PO4: Analyze (L4)	3

CO1: Estimate the hardness of water.

Action Verb: Estimate (L5)

PO4 Verb: Analyze (L4)

CO1 Action Verb is greater than PO4; 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: Estimate the Iron and Calcium in cement.

Action Verb: Estimate **(L5)**

PO4 Verb: Analyze (L4)

CO4 Action Verb is greater than PO4; Therefore correlation is high (3)

CO5: Determine the physical properties like surface tension, adsorption and viscosity.

Action Verb: Determine (L4)

PO4 Verb: Analyze (L4)

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

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

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
(Effective for the batches admitted from 2023-24)
CIVIL ENGINEERING (CE)

Textbooks:

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

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, MediaPromoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.

CO/PO	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	3	3						3			3	3
CO4	3	3	3						3			3	3
CO5	2	2	2						2			3	3

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)

PO3 Verb: **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)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
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CIVIL ENGINEERING (CE)

Year: I B.Tech **Semester**: II

Subject Code: 23APC0102	Subject Name: **Engineering Mechanics & Building Practices Lab**	L T P 0 0 3	Credits:1.5

Course Outcomes: On completion of the course, the student should be able to:

CO1: Evaluate the forces, coefficient of friction between two different surfaces, inclined plane and the roller.
CO2: Analyze the Polygon law of forces and Law of Moment using bell crank lever.
CO3: Evaluate the Centre of gravity for different cross-sections
CO4: Understand the Quality Testing and principles of Non-Destructive Testing for building materials.
CO5: Understand the tools, plumbing practices and safety measures in building construction.

Students have to perform any 10 of the following Experiments:

1. To study various types of tools used in construction-CO5
2. Forces in Pin Jointed Trusses-CO1
3. Experimental Proof of Lami's Theorem-CO1
4. Verification of Polygon law of forces-CO2
5. Determination of Center of Gravity of different shaped Plane Lamina-CO3
6. Determination of coefficient of Static and Rolling Friction-CO1
7. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever-CO2
8. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc.-CO4
9. Field-Visit to understand the Quality Testing – report-CO4
10. Safety Practices in Construction industry-CO5
11. Demonstration of Non-Destructive Testing - using Rebound Hammer & UPV-CO4
12. Study of Plumbing in buildings-CO5

Mapping of course outcomes with program outcomes

Course Outcomes	Programme Outcomes(POs) & Programme Specific Outcomes(PSOs)												
	PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PSO 1	PSO 2
CO1	3	3		3		3							
CO2	3	3		3		3							
CO3	3	3		3		3							
CO4	2	1					2						
CO5	2	1					2						

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

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CIVIL ENGINEERING (CE)

Unit No	Course Outcomes		Program Outcome (PO)	PO(s):Action Verb and BTL(for PO1 to PO11)	Level of Correlation (0-3)
	CO's Action Verb	BTL			
1	Evaluate	L5	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3
2	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	2 3 3 3
3	Evaluate	L5	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3
4	Understand	L2	PO1 PO2 PO7	Apply-L3 Apply-L3 Thumb Rule (TR)	2 1 2
5	Understand	L2	PO1 PO2 PO7	Apply-L3 Apply-L3 Thumb Rule (TR)	2 1 2

Justification Statements:

CO1: Evaluate the forces, coefficient of friction between two different surfaces, inclined plane and the roller.

Action Verb: **Evaluate (L5)**

PO1 Verb: **Apply (L3)**

CO1 Action verb is above the level of PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze(L4)**

CO1 Action verb is above the level of PO2 verb. Therefore, the correlation is high (3)

PO4 Verb: **Analyze(L4)**

CO1 Action verb is above the level of PO4 verb. Therefore, the correlation is high (3)

PO6 Verb: **Thumb Rule**

CO1 correlates highly with PO6. Therefore, the correlation is high (3)

CO2: Analyze the Polygon law of forces and Law of Moment using bell crank lever.

Action Verb: **Analyze (L4)**

PO1 Verb: **Apply (L3)**

CO2 Action verb is above the level of PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze(L4)**

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

PO4 Verb: **Analyze(L4)**

CO2 Action verb is above the level of PO4 verb. Therefore, the correlation is high (3)

PO6 Verb: **Thumb Rule**

CO2 correlates highly with PO6. Therefore, the correlation is high (3)

CO3: Evaluate the Centre of gravity for different cross-sections

Action Verb: **Analyze (L4)**

PO1 Verb: **Apply (L3)**

CO2 Action verb is above the level of PO1 verb. Therefore, the correlation is high (3)

PO2 Verb: **Analyze(L4)**

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

PO4 Verb: **Analyze(L4)**

CO2 Action verb is above the level of PO4 verb. Therefore, the correlation is high (3)

PO6 Verb: **Thumb Rule**

CO2 correlates highly with PO6. Therefore, the correlation is high (3)

CO4: Understand the Quality Testing and principles of Non-Destructive Testing for building materials.

Action Verb: **Understand (L2)**

PO1 Verb: **Apply (L3)**

CO4 Action verb is not as same level as PO1 verb. Therefore, the correlation is medium (2)

PO2 Verb: **Analyze (L4)**

CO4 Action verb is not as same level as PO2 verb. Therefore, the correlation is low (1)

PO7 Verb: **Thumb Rule**

CO4 correlates medium with PO7. Therefore, the correlation is medium (2)

CO5: Understand the tools, plumbing practices and safety measures in building construction.

Action Verb: **Understand (L2)**

PO1 Verb: **Apply (L3)**

CO5 Action verb is not as same level as PO1 verb. Therefore, the correlation is medium (2)

PO2 Verb: **Analyze (L4)**

CO5 Action verb is not as same level as PO2 verb. Therefore, the correlation is low (1)

PO7 Verb: **Thumb Rule**

CO5 correlates medium with PO7. Therefore, the correlation is medium (2)

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Common to I SEM CSE/CIC/SCD/EEE & 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

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CIVIL ENGINEERING (CE)

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)

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
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CIVIL ENGINEERING (CE)

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)

B.TECH. –CIVIL ENGINEERING

II YEAR COURSE STRUCTURE & SYLLABI

B.Tech. – II Year I Semester

S.No.	Category	Title	L	T	P	Credits
1	23ABS9909	Numerical and Statistical Methods	3	0	0	3
2	23AHM9905	Universal Human Values– Understanding Harmony and Ethical Human Conduct	2	1	0	3
3	23APC0103	Surveying	3	0	0	3
4	23APC0104	Strength of Materials	3	0	0	3
5	23APC0105	Fluid Mechanics	3	0	0	3
6	23APC0106	Surveying Lab	0	0	3	1.5
7	23APC0107	Strength of Materials Lab	0	0	3	1.5
8	23ASC0101	Building Planning and Drawing	0	1	2	2
Total			14	02	08	20

II YEAR **I SEMESTER**

Subject Code	Subject Name	L	T	P	CREDITS
23ABS9909	**NUMERICAL & STATISTICAL METHODS**	**3**	**0**	**0**	**3**

Course Outcomes:

After successful completion of this course, the students should be able to:

CO1:	Analyze relevant numerical techniques for interpolation and concepts of curve fitting
CO2:	Apply the different iteration methods to solve Algebraic, Transcendental and Simultaneous Equations
CO3:	Evaluate different numerical methods with accuracy and efficiency for ordinary differential equations.
CO4:	Analyze the techniques for testing of hypothesis for large samples
CO5:	Analyze the techniques for testing of hypothesis for small samples

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Analyze	relevant numerical techniques	for interpolation and concepts of curve fitting		L4
2	Apply	the different iteration methods	to solve Algebraic, Transcendental and Simultaneous Equations		L3
3	Evaluate	different numerical methods with accuracy and efficiency	for ordinary differential equations		L5
4	Analyze	the techniques for testing of hypothesis	for large samples		L4
5	Analyze	the techniques for testing of hypothesis	for small samples		L4

UNIT I: Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method System of Algebraic equations: Gauss Elimination, Jacoby and Gauss Siedal method.

UNIT II: Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares.

UNIT III: Solution of Initial value problems to Ordinary differential equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and modified Euler's methods-Runge-Kutta methods (second and fourth order).

UNIT IV: Estimation and Testing of hypothesis, large sample tests

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

UNIT V: Small sample tests

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of

variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition.
2. S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.
3. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd.,2021 5th Edition(9th reprint).

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.
2. Ronald E. Walpole, Probability and Statistics for Engineers and Scientists, PNIE
3. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill publishers.
4. S.Chand, Probability and Statistics by Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N.Prasad

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma05/preview
3. http://nptel.ac.in/courses/111105090

CORRELATION OF COS WITH THE POS & PSOS:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		3									
CO2	3										
CO3		3									
CO4		3									
CO5		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 PO11)	Level of Correlation (0-3)
	Lesson Plan (Hrs)	%	correlation	Verb	BTL			
1				Analyze	L4	PO2	Analyze(L4)	3
2				Apply	L3	PO1	Apply(L3)	3
3				Evaluate	L5	PO2	Analyze(L4)	3
4				Analyze	L4	PO2	Analyze(L4)	3
5				Analyze	L4	PO2	Analyze(L4)	3

JUSTIFICATION STATEMENTS:

CO1: Analyze relevant numerical techniques for interpolation and concepts of curve fitting: Analyze (L4)

PO2 Verb: Analyze (L4)

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

CO2: Apply the different iteration methods to solve Algebraic, Transcendental and Simultaneous Equations: Apply (L3) PO1 Verb: **Apply** (L3)
CO1 Action Verb is equal to PO1 verb; Therefore correlation is high (3).

CO3: Evaluate different numerical methods with accuracy and efficiency for ordinary differential equations: Evaluate (L5)
PO2 Verb: Analyze (L4)
CO3 Action verb is high level to PO2 verb; therefore the correlation is high (3).

CO4: Analyze the techniques for testing of hypothesis for large samples: Analyze (L4).
PO2 Verb: Analyze (L4)
CO4 Action Verb level is equal to PO2 verb; Therefore correlation is high (3).

CO5: Analyze the techniques for testing of hypothesis for small samples: Analyze (L4)
PO2 Verb: Analyze (L4)
CO5 Action verb is equal level to PO2 verb; therefore the correlation is high (3).

II YEAR I SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23AHM9905	UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	4	2	0	3

Course Outcomes: After studying the course, students 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 fulfil Human Goal

UNIT IV Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

TEXTBOOKS:

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*, A Nagaraj, 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:

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

CO-PO MAPPING JUSTIFICATION:

CO	CO					Program Outcomes (PO)	PO(s): Action Verb and BTL (for PO1 to PO11)	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).

II YEAR **I SEMESTER**

Subject Code	Subject Name	L	T	P	CREDITS
23APC0103	**SURVEYING**	**3**	**0**	**0**	**3**

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

CO1:	Understand the basics of linear and angular measurements using different methods
CO2:	Apply the concepts of leveling, contouring and computing of Areas and Volumes in earthworks
CO3:	Apply trigonometrical leveling techniques to determine elevations in field scenarios.
CO4:	Apply knowledge of curves and basic principles of modern surveying technologies.
CO5:	Understand the fundamentals of photogrammetry and its applications for surveying.

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	the basics of linear and angular measurements			L2
CO2	Apply	the concepts of leveling, contouring & the techniques of computing Areas and Volumes		In field works	L3
CO3	Apply	the concepts of Theodolite survey		In field works	L3
CO4	Apply	the simple horizontal circular curves, Modern Surveying	in the survey system	for buildings and highway culverts	L3
CO5	Understand	the fundamentals of photogrammetry	in the survey system		L2

UNIT-I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, leveling and Plane table surveying.
Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.
Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination and dip and W.C.B and Q.B systems of locating bearings.

UNIT-II

Leveling- Types of levels, methods of leveling, and Determination of levels, Effect ofCurvature of Earth and Refraction.
Contouring- Characteristics and uses of Contours, methods of contour surveying.
Areas - Determination of areas consisting of irregular boundary and regular boundary.
Volumes -Determination of volume of earth work in cutting and embankments for level

section, capacity of reservoirs.
UNIT-III
Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle,Trigonometrical leveling when base is accessible and inaccessible. **Traversing:** Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements.
UNIT-IV
Curves: Types of curves and their necessity, elements of simple, compound, reverse curves. Introduction to Tachometric Surveying. **Modern Surveying Methods:** Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LiDAR Survey (Light Detection And Ranging).
UNIT-V
Photogrammetry Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo-plotting instruments, mosaics, map substitutes.

TEXTBOOKS:

1. Surveying (Vol – 1 & 2) by Duggal S K, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 5th edition, 2019.
2. Textbook of Surveying by C Venkatramaiah , Universities Press 1st Edition, 2011.

REFERENCES:

1. Surveying (Vol – 1), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi, 18th edition 2024.
2. Surveying (Vol – 2), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi 17th 2022.
3. Surveying (Vol – 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi 16th 2023.
4. Plane Surveying and Higher Surveying‖ by Chandra A M, New age International Pvt. Ltd.,Publishers, New Delhi, 3rd Edition, 2015.
5. Surveying and Levelling by N.Basak Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4th edition, 2014.
6. Surveying (Vol 1, 2 & 3), by Arora K R, Standard Book House, Delhi. Edition: 12th, 2015.

Web Resources:

https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse_itemnumber=23066

CORRELATIONOFCOSWITHTHEPOS&PSOS:

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

CO-POMAPPING JUSTIFICATION:

Unit No	Course Outcomes					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 PO6	Apply (L3) Analyze (L4) Thumb Rule	2 2 2
2				Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
3				Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
4				Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
5				Understand	L2	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	2 2 2

JUDGEMENT STATEMENTS:

CO 1: Understand the basics of linear and angular measurements using different methods
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 one level; Therefore correlation is moderate (2).
CO1 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 2: Apply the concepts of leveling, contouring and computing of Areas and Volumes in earthworks
Action Verb: Apply (L3)
PO1: Apply(L3)
CO2 Action verb is equal to PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO2 Action Verb is low to PO2 verb. Therefore the correlation is medium (2)
CO 2 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO 3: Apply trigonometrical leveling techniques to determine elevations in field scenarios.
Action Verb: Apply (L3)
PO1: Apply(L3)
CO3 Action verb is equal to PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO3 Action Verb is low to PO2 verb. Therefore the correlation is medium (2)
CO 3 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO 4: Apply knowledge of curves and basic principles of modern surveying technologies.
Action Verb: Apply (L3)

PO1: Apply(L3)
CO4 Action verb is equal to PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO4 Action Verb is low to PO2 verb. Therefore the correlation is medium (2)

CO 4 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO 5: Understand the fundamentals of photogrammetry and its applications for surveying.
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 one level; Therefore correlation is moderate (2).
CO1 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

II YEAR I SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23APC0104	STRENGTH OF MATERIALS	3	0	0	3

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

CO1:	Analyze the behavior of composite bars under simple stresses and strains
CO2:	Apply concepts of shear force and bending moment for different load conditions on different types of beams
CO3:	Analyze the behavior of standard cross section subjected to bending, shear and torsional stresses
CO4:	Analyze the displacements of beams and springs using different methods
CO5:	Analyze the critical loads in columns and compound stresses in rigid bodies.

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Analyze	the behavior of composite bars		Under simple stresses and strains	L4
CO2	Apply	concepts of shear force and bending moment	For different load conditions	On different types of beams	L3
CO3	Analyze	The behavior of standard cross section		Subjected to bending, shear and torsional stresses	L4
CO4	Analyze	The displacement of beams and springs		Using different methods	L4
CO5	Analyze	the critical loads and compound stresses		in columns and rigid bodies	L4

UNIT-I
Simple Stresses and Strains: Elasticity and plasticity — Types of stresses and strains — Hooke's law — Factor of safety, Poisson's ratio - Relationship between Elastic constants — Bars of varying section — stresses in composite bars.
UNIT-II
Shear Force and Bending Moment: Definition of beam — Types of beams — Concept of shear force and bending moment — Point of contra flexure — Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads
UNIT-III
Flexural Stresses: Theory of simple bending — Assumptions — Derivation of bending equation, Neutral axis — Determination of bending stresses — section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections — Design of simple beams **Shear Stresses:** Derivation of formula — Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections. **Torsion** – circular shafts only

UNIT-IV
Deflection of Beams: Double integration and Macaulay's methods — Determination of slopeand deflection for cantilever, simply supported and overhanging beams subjected different type of loading - Moment area method — application to simple cases of cantilever. **Springs:** Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple
UNIT-V
Columns: Introduction – Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions– Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula. **Introduction to Thin Cylinders and Compound Stresses:** Derivation of formula for longitudinal and circumferential stresses — hoop, longitudinal and volumetric strains — changes in diameter, and volume of thin cylinders. Compound Stresses: Two-dimensional system, stress at a point on a plane, principal stresses and principal planes,

TEXTBOOKS:

1. R.K. Bansal, Strength of Materials, Lakshmi Publications House Pvt. Ltd, 2015.
2. R. Subramanian, Strength of Materials, Oxford University Press, 2016.
3. S Ramamrutham & R Narayan, Strength of Materials, Dhanpat Rai Publications, 2014

REFERENCES:

1. S.S.Bhavakatti, Strength of Materials, Third Edition, Vikas Publications.
2. S.Timoshenko, Strenth of Materilas Part- 2, Third Edition, CBS Publications.
3. R K Rajput, Strength of Materials, Fifth Edition, S.Chand Publications, 2012

CORRELATION OF COS WITH THE POS & PSOS:

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

CO-PO MAPPING JUSTIFICATION:

Unit No	Course Outcomes					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	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3
2	16/80	20	3	Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
3	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3
4	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3
5	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3

JUSTIFICATION STATEMENTS:

CO1: Analyze the behavior of composite bars under simple stresses and strains
Action Verb: Analyze (L4)
PO1: Apply(L3)
CO1 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO1 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO1 Action Verb is equal to PO4; Therefore correlation is high (3)
CO1 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO2: Apply concepts of shear force and bending moment for different load conditions on different types of beams
Action Verb: Apply (L3)
PO1: Apply(L3)
CO2 Action verb is equal to PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO2: Action Verb is low to PO2 verb. Therefore the correlation is medium (2)
CO2 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO3: Analyze the behavior of standard cross section subjected to bending, shear and torsional stresses
Action Verb: Analyze (L4)
PO1: Apply(L3)
CO1 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO1 Action verb is equal to PO2 verb. Therefore the correlation is high (3)

PO 4: Analysis (L4)
CO1 Action Verb is equal to PO4; Therefore correlation is high (3)
CO1 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO4: Analyze the displacements of beams using different methods (L4)

Action Verb: Analyze (L4)
PO1: Apply(L3)
CO1 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO1 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO1 Action Verb is equal to PO4; Therefore correlation is high (3)
CO1 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO5: Analyze the critical loads in columns and compound stresses in rigid bodies. **(L4)**

Action Verb: Analyze (L4)
PO1: Apply(L3)
CO1 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO1 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO1 Action Verb is equal to PO4; Therefore correlation is high (3)
CO1 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

II YEAR I SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23APC0105	FLUID MECHANICS	3	0	0	3

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

CO1:	Understand the basic characteristics and behavior of fluids
CO2:	Apply the laws of fluid statics and concepts of Buoyancy
CO3:	Apply the law of conservation of mass to differentiate type of flow in a pipe
CO4:	Analyze the discharge of fluid flow in pipes using law of conservation of energy
CO5:	Analyze the energy losses and flow characteristics through closed conduits

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	Basic characteristics and behavior of fluids			L2
CO2	Apply	The laws of fluid statics and concepts of buoyancy			L3
CO3	Apply	The law of conservation of mass and Differentiate type of flow in a pipe			L3
CO4	Analyze	the discharge of fluid flow in pipes using law of conservation of energy			L4
CO5	Analyze	The energy losses and flow characteristics	through Closed Conduits		L4

UNIT-I
Basic concepts and definitions: Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapor pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility.

UNIT-II
Fluid statics: Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.
UNIT-III
Fluid kinematics: Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three - Dimensional continuity equations in Cartesian coordinates.
UNIT-IV
Fluid Dynamics: Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – Derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number.
UNIT-V
Analysis Of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series.

TEXTBOOKS:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

REFERENCE BOOKS:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
3. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
5. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3rd edition 2011.

Online Learning Resources:

https://archive.nptel.ac.in/courses/112/105/112105269/
https://nptel.ac.in/courses/112104118
https://nptel.ac.in/courses/105103192

CORRELATIONOFCOSWITHTHEPOS&PSOS:

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

CO-POMAPPINGJUSTIFICATION:

Unit No	Course Outcomes					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 PO7	Apply (L3) Analyze (L4) Thumb Rule	2 2 2
2				Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
3				Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
4				Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	2 3 3 3
5				Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	2 3 3 3

JUSTIFICATION STATEMENTS:

CO 1: Understand the basic characteristics and behavior of fluids
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 1 Action Verb is less than PO1 verb by one level; Therefore correlation is moderate (2).
PO2: Analyze (L4)
CO 1 Action Verb is less than PO2 verb by one level; Therefore correlation is moderate (2).
CO 1 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 2: Apply the laws of fluid statics and concepts of Buoyancy
Action Verb: Apply (L3)
PO1: Apply(L3)
CO 2 Action verb is equal to PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 2: Action Verb is low to PO2 verb. Therefore the correlation is medium (2)
CO 2 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO 3: Apply the law of conservation of mass to differentiate type of flow in a pipe
Action Verb: Apply (L3)
PO1: Apply(L3)
CO 3 Action verb is equal to PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 3 Action Verb is low to PO2 verb. Therefore the correlation is medium (2)
CO 3 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO 4: Analyze the discharge of fluid flow in pipes using law of conservation of energy
Action Verb: Analyze (L4)
PO1: Apply(L3)
CO 4 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 4 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO 4 Action Verb is equal to PO4; Therefore correlation is high (3)
CO 4 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 5: Analyze the energy losses and flow characteristics through closed conduits
Action Verb: Analyze (L4)
PO1: Apply(L3)
CO 5 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 5 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO 5 Action Verb is equal to PO4; Therefore correlation is high (3)
CO 5 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

II YEAR I SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23APC0106	SURVEYING LAB	0	0	3	3

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

CO1:	Apply surveying techniques (chain & compass) for road profiles, offsets & distances.
CO2:	Analyze the area of a defined boundary using the plane table radiation method
CO3:	Analyze the elevations on the surface of the ground by levelling methods
CO4:	Analyze the height, horizontal and vertical angles by theodolite on earth surface.
CO5:	Evaluate the elevations, depressions, distance, curves and contours on the ground surface for preparation of maps

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Apply	Surveying techniques (chain & compass)		road profiles, offsets & distances.	L3
CO2	Analyze	the area of a defined boundary	using the plane table radiation method		L4
CO3	Analyze	the elevations	by levelling methods	on the surface of the ground	L4
CO4	Analyze	the height, horizontal and vertical angles		by theodolite on earth surface	L4
CO5	Evaluate	the elevations, depressions, distance, curves and contours		on the ground surface for preparation of maps	L5

List of Field Works:

1. Chain survey of road profile with offsets in case of road widening -CO1
2. Determination of distance between two inaccessible points by using compass -CO1
3. Plane table survey: finding the area of a given boundary by the method of radiation –CO2
4. Fly levelling: Height of the instrument method (differential leveling) –CO3
5. Fly levelling: rise and fall method –CO3
6. Theodolite survey: determining the horizontal and vertical angles by the method ofrepetition method -CO4
7. Theodolite survey: finding the distance between two in accessible points -CO4
8. Theodolite survey: finding the height of far object -CO4
9. Determination of area and perimeter using total station -CO4

10. Determination of distance between two inaccessible points by using total station-CO5
11. Setting out a curve using total station-CO5
12. Determining the levels of contours-CO5

CORRELATION OF CO'S WITH THE PO'S &PSO'S:

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

CO-PO MAPPING JUSTIFICATION:

Unit No	Course Outcomes		Program Outcome (PO)	PO(s):Action Verb and BTL(for PO1 to PO11)	Level of Correlation (0-3)
	CO's Action Verb	BTL			
1	Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
2	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	2 3 3 3
3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	2 3 3 3
4	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	2 3 3 3
5	Evaluate	L5	PO1 PO2 PO3 PO4 PO6	Apply (L3) Analyze (L4) Design (L6) Analysis (L4) Thumb Rule	2 2 2 2 3

JUSTIFICATION STATEMENTS:

CO 1: Apply surveying techniques (chain & compass) for road profiles, offsets & distances.
Action Verb: Apply (L3)
PO1: Apply(L3)
CO 1 Action verb is equal to PO1 verb. Therefore the correlation is high (3)

PO2: Analyze (L4)
CO 1 Action Verb is low to PO2 verb. Therefore the correlation is medium (2)
CO 1 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO 2: Analyze the area of a defined boundary using the plane table radiation method
Action Verb: Analyze (L4)
PO1: Apply(L3)
CO 2 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 2 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 3 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 3 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 3: Analyze the elevations on the surface of the ground by levelling methods
Action Verb: Analyze (L4)
PO1: Apply(L3)
CO 3 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 3 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 3 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 3 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 4: Analyze the height, horizontal and vertical angles by theodolite on earth surface.
Action Verb: Analyze (L4)
PO1: Apply(L3)
CO 4 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 4 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 5 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 5 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 5: Evaluate the elevations, depressions, distance, curves and contours on the ground surface for preparation of maps
Action Verb: Evaluate (L5)
PO1: Apply (L3)
CO 5 Action verb is greater than PO1 verb; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 5 Action verb is greater than PO2 verb by one level; Therefore, correlation is moderate (2).
PO3: Design
CO 5 Action verb is less than PO3 verb by one level; Therefore, correlation is moderate (2).
PO4: Design
CO 5 Action verb is less than PO3 verb by one level; Therefore, correlation is moderate (2).
PO6: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO6 as High (3)

II YEAR I SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23APC0107	STRENGTH OF MATERIALS LAB	0	0	3	3

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

CO1:	Apply the engineering principles to analyze the support reactions and bending behavior of beams under different support conditions
CO2:	Analyze the relationship between material elastic properties and the performance of mechanical components.
CO3:	Analyze the behavior of steel under impact load and couple acting on it.
CO4:	Analyze the load-deflection behavior of open-coiled and close-coiled springs under compression
CO5:	Evaluate the compressive strength and failure modes of wood and concrete specimens

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Apply	the engineering principles to analyze the support reactions and bending behavior	under different loading conditions	of beams	L3
CO2	Analyze	the relationship between material properties		the performance of mechanical components	L4
CO3	Analyze	the behavior of steel	Under impact load and couple acting on it.		L4
CO4	Analyze	the load-deflection behavior of open-coiled and close-coiled springs	under compression		L4
CO5	Evaluate	the compressive strength and failure modes		of wood and concrete Specimen	L5

LIST OF EXPERIMENTS:

1. Tension test -CO2
2. Bending test on (Steel/Wood) Cantilever beam -CO1
3. Bending test on simply supported beam -CO1
4. Torsion test –CO3
5. Hardness test -CO2
6. Compression test on O0pen coiled springs –CO4
7. Tension test on Closely coiled springs –CO4
8. Compression test on wood/ concrete –CO5
9. Izod / Charpy Impact test on metals –CO3
10. Shear test on metals –CO3
11. Use of electrical resistance strain gauges –CO2
12. Continuous beam – deflection test -CO1

CORRELATION OF COS WITH THE POS & PSOS:

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

CO-PO MAPPING JUSTIFICATION:

Unit No	Course Outcomes		Program Outcome (PO)	PO(s): Action Verb and BTL (for PO1 to PO11)	Level of Correlation (0-3)
	CO's Action Verb	BTL			
1	Apply	L3	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	3 2 2
2	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3
3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analysis (L4) Thumb Rule	3 3 3 3
4	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analysis (L4) Thumb Rule	3 3 3 3
5	Evaluate	L5	PO1 PO2 PO3 PO4 PO6	Apply (L3) Analyze (L4) Design (L6) Analysis (L4) Thumb Rule	2 2 2 2 3

JUSTIFICATION STATEMENTS:

CO1: Apply the engineering principles to analyze the support reactions and bending behavior of beams under different support conditions

Action Verb: Apply (L4)

PO1: Apply(L3)
CO 1 Action verb is equal to PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 1 Action Verb is low to PO2 verb. Therefore the correlation is medium (2)
CO 1 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO2: Analyze the relationship between material elastic properties and the performance of mechanical components.

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO2 Action verb is equal to PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO2: Action Verb is low to PO2 verb. Therefore, the correlation is medium (2)
CO2 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO3: Analyze the behavior of steel under impact load and couple acting on it.

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO1 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO1 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO1 Action Verb is equal to PO4; Therefore correlation is high (3)
CO1 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO4: Analyze the load-deflection behavior of open-coiled and close-coiled springs under compression

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 4 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 4 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 5 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 5 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO5: Evaluate the compressive strength and failure modes of wood and concrete specimens

Action Verb: Evaluate (L5)

PO1: Apply (L3)
CO 5 Action verb is greater than PO1 verb; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 5 Action verb is greater than PO2 verb by one level; Therefore, correlation is moderate (2).
PO3: Design
CO 5 Action verb is less than PO3 verb by one level; Therefore, correlation is moderate (2).
PO4: Design
CO 5 Action verb is less than PO3 verb by one level; Therefore, correlation is moderate (2).
PO6: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO6 as High (3)

II YEAR I SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23ASC0101	**BUILDING PLANNING AND DRAWING**	**0**	**1**	**2**	**2**

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

CO1:	Apply the sign conventions to represent various building materials
CO2:	Apply the distinct brickwork patterns used in construction
CO3:	Create the building elements as per building bye-laws
CO4:	Create the residential building as per building bye-laws
CO5:	Create the public and industrial buildings as per building bye-laws

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Apply	the sign conventions		to represent various building materials	L3
CO2	Apply	the distinct brickwork patterns		used in construction	L3
CO3	Create	the building elements	as per building bye-laws		L6
CO4	Create	the residential building	as per building bye-laws		L6
CO5	Create	the public and industrial buildings	as per building bye-laws		L6

Syllabus:

1. Detailing & Drawing of Sign Conventions-CO1
2. Detailing & Drawing of English Bond-CO2
3. Detailing & Drawing of Flemish Bond-CO2
4. Detailing & Drawing of Doors-CO3
5. Detailing & Drawing of Windows-CO3
6. Detailing & Drawing of Ventilators &Roofs-CO3
7. Drawing of Line Diagram of Residential Buildings by using Building Bye- Laws -CO4
8. Drawing of Plan, Elevation & Section from line diagram for a single Storey Building-CO4
9. Drawing of Plan, Elevation & Section for Hospital Building -CO5
10. Drawing of Plan, Elevation & Section for Industrial Building -CO5

Text Books:

1. Planning, designing and Scheduling, Gurcharan Singh and Jagdish Singh
2. Building planning and drawing by Dr. N. Kumara Swamy & A. Kameswara Rao.
3. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.

Reference Books:

1. National Building Code 2016 (Volume- I & II).
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, NewDelhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai

CORRELATION OF CO'S WITH THE PO'S & PSO'S:

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

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	Apply	L3	PO1 PO5 PO6	Apply(L3) Create(L5) Thumb Rule	3 2 2
2	Apply	L3	PO1 PO5 PO6	Apply(L3) Create(L5) Thumb Rule	3 2 2
3	Create	L6	PO1 PO2 PO3 PO4 PO6	Apply (L3) Analyze (L4) Design (L6) Analysis (L4) Thumb Rule	2 2 3 2 3
4	Create	L6	PO1 PO2 PO3 PO4 PO6	Apply (L3) Analyze (L4) Design (L6) Analysis (L4) Thumb Rule	2 2 3 2 3
5	Create	L6	PO1 PO2 PO3 PO4 PO6	Apply (L3) Analyze (L4) Design (L6) Analysis (L4) Thumb Rule	2 2 3 2 3

JUSTIFICATION:

CO1: Apply the sign conventions to represent various building materials.

Action Verb: Apply (L3) PO1 Verb: Apply (L3)

CO1 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)

PO5 Verb: Create (L6)

CO1 Action verb is less than level as PO5 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 distinct brickwork patterns used in construction.
Action Verb: Apply (L3) PO1 Verb: Apply (L3)
CO2 Action verb is same level as PO1 verb. Therefore, the correlation is high (3)
PO5 Verb: Create (L6)
CO2 Action verb is less than level as PO5 verb. Therefore, the correlation is medium (2)
PO6 Verb: Thumb Rule
CO2 Correlates medium with PO6. Therefore, the correlation is medium (2)

CO3: Create the building elements as per building bye-laws.
Action Verb: Create (L6) PO1: Apply (L3)
CO: Action verb is greater than PO1 verb; Therefore correlation is moderate (2).
PO2: Analyze (L4)
CO Action verb is greater than PO2 verb by one level; Therefore correlation is moderate (2).
PO3: Design
CO Action verb is equal to PO3 verb by one level; Therefore, correlation is high (3).
PO4: Analysis
CO Action verb is less than PO3 verb; Therefore, correlation is moderate (2).
PO6: Action verb Evaluate is of BTL 6. Using Thumb rule, L6 correlates PO6 as High (3**CO4: Create** the residential building as per building bye-laws.

CO4: Create the residential building as per building bye-laws
Action Verb: Create (L6) PO1: Apply (L3)
CO 4: Action verb is greater than PO1 verb; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 4 Action verb is greater than PO2 verb by one level; Therefore, correlation is moderate (2).
PO3: Design
CO 4 Action verb is equal to PO3 verb by one level; Therefore, correlation is high (3).
PO4: Analysis
CO 4 Action verb is less than PO3 verb; Therefore, correlation is moderate (2).
PO6: Action verb Evaluate is of BTL 6. Using Thumb rule, L6 correlates PO6 as High (3)

CO5: Create public and industrial buildings as per building bye-laws
Action Verb: Create (L6) PO1: Apply (L3)
CO 5: Action verb is greater than PO1 verb; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 5 Action verb is greater than PO2 verb by one level; Therefore, correlation is moderate (2).
PO3: Design
CO 5 Action verb is equal to PO3 verb by one level; Therefore, correlation is high (3).
PO4: Analysis
CO 5 Action verb is less than PO3 verb; Therefore, correlation is moderate (2).
PO6: Action verb Evaluate is of BTL 6. Using Thumb rule, L6 correlates PO6 as High (3)

B.Tech. II Year II Semester

S.No.	Category	Title	L	T	P	Credits
1	23AHMMB01	Managerial Economics and FinancialAnalysis	2	0	0	2
2	23APC0108	Engineering Geology	3	0	0	3
3	23APC0109	Concrete Technology	3	0	0	3
4	23APC0110	Structural Analysis	3	0	0	3
5	23APC0111	Hydraulics &Hydraulic Machinery	3	0	0	3
6	23APC0112	Concrete Technology Lab	0	0	3	1.5
7	23APC0113	Engineering Geology lab	0	0	3	1.5
8	23ASC9901	Soft Skills	0	1	2	2
9	23AES0304	Design Thinking & Innovation	1	0	2	2
10	23AMC9901	Environmental Science	2	0	0	-
Total			17	1	10	21
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

II Year **II Semester**

Subject Code	Subject Name	L	T	P	CREDITS
23AHMMB01	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**	**2**	**0**	**0**	**2**

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

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.

UNIT-III **Business Organizations and Markets**

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.

UNIT-IV **Capital Budgeting**

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.

Textbooks:

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

Reference Books:

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

Online Learning Resources:

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

CORRELATION OF COS WITH THE POS & PSOS:

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

CO-PO MAPPING JUSTIFICATION:

Unit No	Course Outcomes					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**	16.1%	2	Apply	L3	PO1	Apply	3
2	14	22.5%	3	Understand	L2	PO2	Analyse	1
3	14	22.5%	3	Analyze	L4	PO1	Apply	3
4	10	16.1%	2	Evaluate	L5	PO2	Analyse	3
5	14	22.5%	3	Analyze	L4	PO2	Analyse	3

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)
PO2: Analyze (L4)
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)

CO4: Evaluate the capital budgeting techniques to invest in various projects.
Action Verb: Evaluate (L5)
PO2: Analyze
CO3 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)
PO2: Analyze (L4)
CO5 Action verb is same as PO2 verb. Therefore the correlation is high (3)

II YEAR **II SEMESTER**

Subject Code	Subject Name	L	T	P	CREDITS
23APC0108	**ENGINEERING GEOLOGY**	**3**	**0**	**0**	**3**

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

CO1:	Understand the importance of Geology in Civil engineering
CO2:	Understand the classification and properties of minerals and rocks
CO3:	Apply the structural geology in rocks
CO4:	Understand the concept of Ground water, Natural Disasters using Geophysical methods
CO5:	Understand the geological strata for construction of Dams, tunnels, and reservoirs

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	Importance of Geology			L2
CO2	Understand	Classification and properties		Minerals and rocks	L2
CO3	Apply	Structural geology		Rocks	L3
CO4	Understand	Concept of Ground water, Natural Disasters	Geophysical methods		L2
CO5	Understand	Geological strata for construction		Dams, tunnels, and reservoirs	L2

UNIT-I

Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies, weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

UNIT-II

Mineralogy And Petrology: Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures,textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

UNIT-III

Structural Geology: Strike , Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

UNIT-IV

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques.

Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides.

Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT-V

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

Textbooks:

1. Principles of Engineering Geology by K.V.G.K. Gokhale, B.S. Publications
2. Engineering Geology by D.Venkata Reddy Vikas Publications
3. Engineering Geology by Vasudev Kanithi Universities Press

Reference Books:

1. Engineering Geology by N. Chenna Kesavulu, Laxmi Publications . 2ndEdn 2014.
2. Engineering Geology by Subinoy Gangopadhay Oxford University press 1st edition,2012.
3. Engineering & General Geology by Parbin Singh Katson educational series 8th2023
4. Engineering Geology by S.K. Duggal, H.K. Pandey & N. Rawal Mc Graw-Hill

Online Learning Resources:

1. https://nptel.ac.in/courses/105105106
2. https://onlinecourses.nptel.ac.in/noc23_ce107/preview
3. https://www.nptelvideos.com/civil_engineering/engineering_geology_video_lectures.php
4. https://archive.nptel.ac.in/courses/105/104/105104147/

CORRELATION OF CO'S WITH THE PO'S & PSO'S:

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

CO-PO MAPPING JUSTIFICATION:

Unit No	Course Outcomes					Program Outcome (PO)	PO(s): Action Verb and BTL (forPO1 to PO11)	Level of Correlation (0-3)
	Lesson Plan Hrs	%	Correlation	CO's Action Verb	BTL			
1	12/65	18	2	Understand	L2	PO1 PO2 PO6	Apply(L3) Analyze(L4) Thumb Rule	2 2 2
2	12/65	18	2	Understand	L2	PO1 PO2 PO6	Apply(L3) Analyze(L4) Thumb Rule	2 2 2

3	17/65	26	3	Apply	L3	PO1 PO2 PO6	Apply(L3) Analyze(L4) Thumb Rule	3 2 2
4	12/65	18	2	Understand	L2	PO1 PO2 PO6	Apply(L3) Analyze(L4) Thumb Rule	2 2 2
5	12/65	18	2	Understand	L2	PO1 PO2 PO6	Apply(L3) Analyze(L4) Thumb Rule	2 2 2

JUSTIFICATION STATEMENTS:

CO 1: Understand the importance of Geology in Civil engineering
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 1 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 1 Action Verb is less than PO2 verb by one level; Therefore, correlation is moderate (2).
CO 1 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 2: Understand the classification and properties of minerals and rocks
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 2 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 2 Action Verb is less than PO2 verb by one level; Therefore, correlation is moderate (2).
CO 2 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 3: Apply the structural geology in rocks
Action Verb: Apply (L3)
PO1: Apply(L3)
CO 3 Action verb is equal to PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 3: Action Verb is low to PO2 verb. Therefore, the correlation is medium (2)
CO 3 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO 4: Understand the concept of Ground water, Natural Disasters using Geophysical methods
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 2 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 2 Action Verb is less than PO2 verb by one level; Therefore, correlation is moderate (2).
CO 2 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 5: Understand the geological strata for construction of Dams, tunnels, and reservoirs
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 2 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 2 Action Verb is less than PO2 verb by one level; Therefore, correlation is moderate (2).
CO 2 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

II YEAR II SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23APC0109	**CONCRETE TECHNOLOGY**	**3**	**0**	**0**	**3**

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

CO1:	Understand the basic ingredients of concrete
CO2:	Understand the manufacturing process and fresh properties of concrete
CO3:	Understand the concepts of strength gain and hardened properties of concrete
CO4:	Understand the engineering properties and special applications of concrete.
CO5:	Design concrete mix proportioning for economical and durable concrete

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Understand	the basic ingredients		of concrete	L2
CO2	Understand	the manufacturing process and fresh properties of concrete		of concrete	L2
CO3	Understand	the concepts of strength gain and hardened properties		of concrete	L2
CO4	Understand	the engineering properties of concrete and applications		of various special concretes	L2
CO5	Design	concrete mix proportioning		for economical and durable concrete	L6

UNIT-I

CEMENTS: Portland cement – Chemical composition – Hydration, Setting of cement,Fineness of cement, Structure of hydrate cement – Test for physical properties – Differentgrades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume **AGGREGATES:** Classification of aggregate – Particle shape & texture – Bond, strength &other mechanical properties of aggregates – Specific gravity, Bulk density, porosity,adsorption & moisture content of aggregate – Bulking of sand – Deleterious substances –Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Finenessmodulus – Grading curves – Grading of fine & coarse Aggregates – Maximum aggregate size- Quality of mixing water

UNIT-II

FRESH CONCRETE: Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete

UNIT-III
HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gel/space ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing Testing of Hardened Concrete: Compression test – Tension test – Factors affecting strength –Flexure test –Splitting test – Non-destructive testing methods – Codal provisions for NDT
UNIT-IV
ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage
UNIT-V
MIX DESIGN AND SPECIAL CONCRETES: Factors in the choice of mix proportions –Quality control of concrete- Statistical methods-Acceptance Criteria-Concepts Proportioning of concrete mixes by ACI method and IS Code method Ready mixed concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self-healing concrete.

Textbooks:

1. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5th edition 2013.
3. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi

References

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGraw Hill 4th edition 2014
2. Properties of Concrete by A.M. Neville – PEARSON – 4th edition
3. Concrete Technology by Job Thomas, Cengagae Publications, 1st edition, 2015
4. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.

Code book:

IS Code:IS 10262 – 2019

CORRELATIONOFCOSWITHTHEPOS&PSOS:

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

CO-POMAPPINGJUSTIFICATION:

Unit No	Course Outcomes					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	9/60	15	2	Understand	L2	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	2 2 2
2	11/60	18	2	Understand	L2	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	2 2 2
3	11/60	18	2	Understand	L2	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	2 2 2
4	10/60	17	2	Understand	L2	PO1 PO2 PO6	Apply (L3) Analyze (L4) Thumb Rule	2 2 2
5	19/60	32	3	Design	L6	PO1 PO2 PO3 PO4 PO6	Apply (L3) Analyze (L4) Thumb Rule Analyze (L4) Thumb Rule	2 2 3 2 3

JUSTIFICATION STATEMENTS:

CO 1: Understand the basic ingredients of concrete
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 1 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 1 Action Verb is less than PO2 verb by one level; Therefore, correlation is moderate (2).
CO 1 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 2: Understand the manufacturing process and fresh properties of concrete
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 2 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 2 Action Verb is less than PO2 verb by one level; Therefore, correlation is moderate (2).
CO 2 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 3: Understand the concepts of strength gain and hardened properties of concrete
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 3 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 3 Action Verb is less than PO2 verb by one level; Therefore, correlation is moderate (2).
CO 3 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 4: Understand the engineering properties and special applications of concrete.
Action Verb: Understand (L2)
PO1: Apply(L3)

CO 4 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 4 Action Verb is less than PO2 verb by one level; Therefore, correlation is moderate (2).
CO 4 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO: Design concrete mix proportioning for economical and durable concrete
Action Verb: Design (L6)
PO1: Apply (L3)
CO: Action verb is greater than PO1 verb; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO Action verb is greater than PO2 verb by one level; Therefore, correlation is moderate (2).
PO3: Design
CO Action verb is equal to PO3 verb by one level; Therefore, correlation is high (3).
PO4: Analysis
CO Action verb is less than PO3 verb; Therefore, correlation is moderate (2).
PO6: Action verb Design is of BTL 6. Using Thumb rule, L6 correlates PO6 as High (3)

II YEAR II SEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23APC0110	STRUCTURAL ANLAYSIS	3	0	0	3

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

CO1:	Analyze the beams and trusses using Energy Theorems.
CO2:	Analyze indeterminate structures by using Castigliano's–II theorem
CO3:	Analysis of fixed and continuous beams
CO4:	Analyze continuous beams and portal frames by using slope-deflection method
CO5:	Analyze continuous beams and portal frames by using moment distribution method

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Analyze	Energy Theorems	Castigliano"s theorems-I	Analysis of beam and Frame	L4
CO2	Analyze	Indeterminate Trusses	Castigliano"s theorems-II	analysis of indeterminate structures	L4
CO3	Analyze	Fixed and Continues Beams		Analysis of Fixed and Continuos Beams	L4
CO4	Analyze	Beam and Portal Frames	Slope Deflection Method	Analysis of Beams and Frames structures	L4
CO5	Analyze	Beam and Portal Frames	Moment Distribution Method	Analysis of Beams and Frames structures	L4

UNIT-I
ENERGY THEOREMS: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano's – I theorem. Deflections of simple beams and pin jointed trusses.
UNIT-II
ANALYSIS OF INDETERMINATE STRUCTURES: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies –Castigliano's–II theorem.
UNIT-III
FIXED BEAMS & CONTINUOUS BEAMS : Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.
UNIT-IV
SLOPE-DEFLECTION METHOD: Introduction-derivation of slope deflection equations-application to continuous beams with and without settlement of supports - Analysis of single- bay portal frames without sway.

UNIT-V
MOMENT DISTRIBUTION METHOD: Introduction to moment distribution method- Application to continuous beams with and without settlement of supports - Analysis of single- bay storey portal frames without sway.

Textbooks:

1. Analysis of Structures – Vol-I&II by V.N.Vazirani & M.M.Ratwani, Khanna Publications, New Delhi.
2. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers. 3rd edition 2017.

Reference Books:

1. Structural analysis by Aslam Kassimali Cengage publications 6th edition 2020.
2. Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.PPerumal– Laxmi publications. 3rd 2016
3. Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.

Online Study Source

https://archive.nptel.ac.in/courses/105/105/105105166/
https://onlinecourses.nptel.ac.in/noc24_ce31/preview

CORRELATION OF CO'S WITH THE PO'S&PSO'S:

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

CO-PO MAPPING JUSTIFICATION:

Unit No	Course Outcomes					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	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3
2	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3
3	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule)	3 3 3 3
4	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule)	3 3 3 3
5	16/80	20	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analyze (L4) Thumb Rule	3 3 3 3

JUSTIFICATION STATEMENTS:

CO 1: Analyze the beams and trusses using Energy Theorems.

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 1 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 1 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 1 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 1 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 2: Analyze indeterminate structures by using Castigliano's–II theorem

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 2 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 2 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 2 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 2 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 3: Analysis of fixed and continuous beams

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 3 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)

CO 3 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 3 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 3 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 4: Analyze continuous beams and portal frames by using slope-deflection method

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 4 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 4 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 4 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 4 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO5: Analyze continuous beams and portal frames by using moment distribution method

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 5 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 5 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 5 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 5 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

II YEAR IISEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23APC0111	Hydraulics &Hydraulic Machinery	3	0	0	3

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

CO1:	Apply the Laminar and Turbulent flow concept in pipes
CO2:	Analyze the uniform flows in open-channel flow systems.
CO3:	Analyze the uniform flows in open-channel flow systems.
CO4:	Evaluate the performance of impact of jets on plates and its application in different turbines.
CO5:	Analyze the performance of Centrifugal pumps

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Apply	the laminar and turbulent concept	in pipes		L2
CO2	Analyze	The uniform flows	in open-channel flow systems		L4
CO3	Analyze	The non-uniform flows	in open-channel flow systems		L4
CO4	Evaluate	The performance of impact of jets	Plates & turbines		L5
CO5	Analyze	The performance of centrifugal pumps			L4

UNIT-I
Laminar & Turbulent flow in pipes: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke‘s law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody‘s diagram – Introduction to boundary layer theory.
UNIT-II
Uniform flow in Open Channels: Open Channel Flow - Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections: Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors.
UNIT-III
Non-Uniform flow in Open Channels: Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.
UNIT-IV
Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency

Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation : causes and effects.
UNIT-V
Pumps: Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies.

TEXTBOOKS:

3. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.
4. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

REFERENCE BOOKS:

6. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
7. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
8. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
9. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
10. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3rd edition 2011.

Online Learning Resources:

https://nptel.ac.in/courses/105105203
https://archive.nptel.ac.in/courses/112/106/112106300/
https://archive.nptel.ac.in/courses/112/103/112103249/

CORRELATIONOFCOSWITHTHEPOS&PSOS:

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

CO-POMAPPINGJUSTIFICATION:

Unit No	Course Outcomes					Program Outcome (PO)	PO(s): Action Verb and BTL(forPO 1 to PO11)	Level of Correlation (0-3)
	Lesson Plan Hrs	%	Correlation	CO's Action Verb	BTL			
1	11/82	13	2	Understand	L2	PO1 PO2 PO6	Apply (L3) Analyze(L4) Thumb Rule	2 1 2
2	17/82	21	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply(L3) Analyze(L4) Analyze(L4) Thumb Rule	2 3 3 3
3	17/82	21	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply(L3) Analyze(L4) Analyze(L4) Thumb Rule	2 3 3 3
4	19/82	23	3	Evaluate	L5	PO1 PO2 PO3 PO4 PO6	Apply(L3) Analyze(L4) Design(L6) Analysis(L4) Thumb Rule	2 2 2 2 3
5	18/82	22	3	Analyze	L4	PO1 PO2 PO4 PO6	Apply(L3) Analyze(L4) Analyze(L4) Thumb Rule	2 3 3 3

JUSTIFICATION STATEMENTS:

CO 1: Apply the Laminar and Turbulent flow concept in pipes
Action Verb: Understand (L2)
PO1: Apply(L3)
CO 1 Action Verb is less than PO1 verb by one level; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 1 Action Verb is less than PO2 verb by one level; Therefore, correlation is low (1).
CO 1 Action Verb is of BTL 2. Using Thumb rule, L2 correlates PO6 as moderate (2).

CO 2: Analyze the uniform flows in open-channel flow systems.

Action Verb: Analyze (L4)
PO1: Apply(L3)
CO 2 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 2 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO 2 Action Verb is equal to PO4; Therefore correlation is high (3)
CO 2 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 3: Analyze the uniform flows in open-channel flow systems.

Action Verb: Analyze (L4)
PO1: Apply(L3)
CO 3 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 3 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO 3 Action Verb is equal to PO4; Therefore correlation is high (3)

CO 3 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 4: Evaluate the performance of impact of jets on plates and its application in different turbines.
Action Verb: Evaluate (L5)
PO1: Apply (L3)
CO 4: Action verb is greater than PO1 verb; Therefore, correlation is moderate (2).
PO2: Analyze (L4)
CO 4Action verb is greater than PO2 verb by one level; Therefore, correlation is moderate (2).
PO3: Design
CO 4 Action verb is less than PO3 verb by one level; Therefore, correlation is moderate (2).
PO4: Design
CO 4 Action verb is less than PO3 verb by one level; Therefore, correlation is moderate (2).
PO6: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO6 as High (3)
PO11: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO11 as High (3)

CO 5: Analyze the performance of Centrifugal pumps

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 5 Action verb is greater than PO1 verb. Therefore, the correlation is high (3)
PO2: Analyze (L4)
CO 5 Action verb is equal to PO2 verb. Therefore, the correlation is high (3)
PO 4: Analysis (L4)
CO 5 Action Verb is equal to PO4; Therefore, correlation is high (3)
CO 5 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

II YEAR IISEMESTER

Subject Code	Subject Name	L	T	P	CREDITS
23APC0112	Concrete Technology Lab	**0**	**0**	**3**	**1.5**

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

CO1: Evaluate the quality and suitability of cement for concrete production
CO2: Evaluate the properties of fine aggregate for concrete production
CO3: Evaluate the properties of coarse aggregate for concrete production
CO4: Analyze the fresh properties of concrete by various test methods
CO5: Analyze the hardened properties of concrete by various test methods

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Evaluate	the quality and suitability of cement		for concrete production	L5
CO2	Evaluate	the properties of fine aggregate		for concrete production	L5
CO3	Evaluate	the properties of coarse aggregate		for concrete production	L5
CO4	Analyze	the fresh properties		of concrete	L4
CO5	Analyze	the hardened properties		of concrete	L4

LIST OF EXPERIMENTS

1. Tests on Cement – CO1

- Normal Consistency and Fineness of cement.
- Initial setting time and Final setting time of cement.
- Specific gravity and soundness of cement.
- Compressive strength of cement.

2. Tests on Fine Aggregates –CO2

- Grading and fineness modulus of Fine aggregate by sieve analysis.
- Specific gravity of fine aggregate
- Water absorption and Bulking of sand.

3. Tests on Coarse Aggregates –CO3

- Grading and fineness modulus of coarse aggregate by sieve analysis.
- Specific gravity of coarse aggregate
- Water absorption of Coarse aggregates

4. Tests on fresh Concrete –CO4

- Workability of concrete by compaction factor method
- Workability of concrete by slump test
- Workability of concrete by Vee-bee test.

5. Tests on Hardened Concrete –CO5

- Compressive strength of cement concrete and Modulus of rupture
- Young's Modulus and Poisson's Ratio
- Split tensile strength of concrete.
- Non-Destructive testing on concrete (for demonstration)

MAPPING OF COS TO POS AND PSOS

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

CO-PO MAPPING JUSTIFICATION:

Unit No	**Course Outcomes**		**Program Outcome (PO)**	**PO(s): Action Verb and BTL (for PO1 to PO11)**	**Level of Correlation (0-3)**
	CO's Action Verb	**BTL**			
1	Evaluate	L5	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analysis (L4) Thumb Rule	3 3 3 3
2	Evaluate	L5	PO1 PO2 PO4 PO6 PO11	Apply (L3) Analyze (L4) Analysis (L4) Thumb Rule Thumb Rule	3 3 3 3 3
3	Evaluate	L5	PO1 PO2 PO4 PO6 PO11	Apply (L3) Analyze (L4) Analysis (L4) Thumb Rule Thumb Rule	3 3 3 3 3
4	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analysis (L4) Thumb Rule	3 3 3 3
5	Analyze	L4	PO1 PO2 PO4 PO6	Apply (L3) Analyze (L4) Analysis (L4) Thumb Rule	3 3 3 3

JUSTIFICATION STATEMENTS:

CO 1: Evaluate the quality and suitability of cement for concrete production

Action Verb: Evaluate (L5)

PO1: Apply (L3)

CO 1: Action verb is greater than PO1 verb; Therefore correlation is moderate (2).

PO2: Analyze (L4)

CO 1 Action verb is greater than PO2 verb by one level; Therefore correlation is moderate (2).

PO3: Design

CO 1 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).

PO4: Design

CO 1 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).

PO6: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO6 as High (3)

PO11: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO11 as High (3)

CO 2: Evaluate the properties of fine aggregate for concrete production

Action Verb: Evaluate (L5)

PO1: Apply (L3)

CO 2: Action verb is greater than PO1 verb; Therefore correlation is moderate (2).

PO2: Analyze (L4)

CO 2 Action verb is greater than PO2 verb by one level; Therefore correlation is moderate (2).

PO3: Design

CO 2 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).

PO4: Design

CO 2 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).

PO6: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO6 as High (3)

PO11: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO11 as High (3)

CO 3: Evaluate the properties of coarse aggregate for concrete production

Action Verb: Evaluate (L5)

PO1: Apply (L3)

CO 3: Action verb is greater than PO1 verb; Therefore correlation is moderate (2).

PO2: Analyze (L4)

CO 3 Action verb is greater than PO2 verb by one level; Therefore correlation is moderate (2).

PO3: Design

CO 3 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).

PO4: Design

CO 3 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).

PO6: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO6 as High (3)

PO11: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO11 as High (3)

CO 4: Analyze the fresh properties of concrete by various test methods

Action Verb: Analyze (L4)

PO1: Apply(L3)

CO 4 Action verb is greater than PO1 verb. Therefore the correlation is high (3)

PO2: Analyze (L4)

CO 4 Action verb is equal to PO2 verb. Therefore the correlation is high (3)

PO 4: Analysis (L4)

CO 4 Action Verb is equal to PO4; Therefore correlation is high (3)

CO 4 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 5: Analyze the hardened properties of concrete by various test methods

Action Verb: Analyze (L4)

PO1: Apply(L3)

CO 5 Action verb is greater than PO1 verb. Therefore the correlation is high (3)

PO2: Analyze (L4)

CO 5 Action verb is equal to PO2 verb. Therefore the correlation is high (3)

PO 4: Analysis (L4)

CO 5 Action Verb is equal to PO4; Therefore correlation is high (3)

CO 5 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

II YEAR **II SEMESTER**

Subject Code	Subject Name	L	T	P	CREDITS
23APC0113	**Engineering Geology lab**	0	0	3	1.5

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

CO1:	Apply the physical properties of minerals and rocks to real world scenarios
CO2:	Evaluate the accuracy and limitations of geological maps based on the data used for their formation
CO3:	Analyze basic strike and dip problems using geological maps and sections
CO4:	Evaluate the Strength of rocks using laboratory equipment's
CO5:	Analyze the Bore Hole data and Field data

Course Outcomes	Action Verb	Knowledge Statement	Condition	Criteria	Blooms Level
CO1	Apply	The physical properties of minerals and rocks		Real world scenarios	L3
CO2	Evaluate	Accuracy and limitations of geological maps	Based on the data used for their formation		L5
CO3	Analyze	basic strike and dip problem		using geological maps and sections	L4
CO4	Evaluate	Strength of rocks		using laboratory equipment's	L5
CO5	Analyze	Bore Hole data and Field data		from the field	L4

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of
   a) Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
   b) Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc…
2. Megascopic description and identification of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite &Biotiteschist, Marble, Khondalite, etc.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

Reference Books:

1. 'Applied Engineering Geology Practicals' by M T Mauthesha Reddy, New Age International Publishers, 2nd Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition, 2009.

CORRELATION OF CO'S WITH THE PO'S&PSO'S:

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

CO-PO MAPPING 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	Apply	L3	PO1 PO2 PO4 PO6	Apply(L3) Analyze(L4) Analyze(L4) Thumb Rule	2 2 3 3
2	Evaluate	L5	PO1 PO2 PO4 PO6 PO11	Apply(L3) Analyze(L4) Analyze(L4) Thumb Rule Thumb Rule	3 3 3 3 3
3	Analyze	L4	PO1 PO2 PO4 PO6	Apply(L3) Analyze(L4) Analyze(L4) Thumb Rule	3 3 3 3
4	Evaluate	L5	PO1 PO2 PO4 PO6 PO11	Apply(L3) Analyze(L4) Analyze(L4) Thumb Rule Thumb Rule	3 3 3 3 3
5	Analyze	L4	PO1 PO2 PO4 PO6	Apply(L3) Analyze(L4) Analyze(L4) Thumb Rule	3 3 3 3

JUSTIFICATION STATEMENTS:

CO 1: Apply the physical properties of minerals and rocks to real world scenarios
Action Verb: Apply (L3)
PO1: Apply(L3)
CO 1 Action verb is equal to PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 1Action Verb is low to PO2 verb. Therefore the correlation is medium (2)
CO 1 Action verb Apply is of BTL 3. Using Thumb rule, L3 correlates PO6 as moderate (2).

CO 2: Evaluate the accuracy and limitations of geological maps based on the data used for their formation
Action Verb: Evaluate (L5)

PO1: Apply (L3)
CO 2 Action verb is greater than PO1 verb; Therefore correlation is moderate (2).
PO2: Analyze (L4)
CO 2 Action verb is greater than PO2 verb by one level; Therefore correlation is moderate (2).
PO3: Design
CO 2 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).
PO4: Design
CO 2 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).
PO6: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO6 as High (3)
PO11: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO11 as High (3)

CO 3: Analyze basic strike and dip problems using geological maps and sections

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 3 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 3 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO 3 Action Verb is equal to PO4; Therefore correlation is high (3)
CO 3 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

CO 4: Evaluate the Strength of rocks using laboratory equipment's
Action Verb: Evaluate (L5)

PO1: Apply (L3)
CO 4 Action verb is greater than PO1 verb; Therefore correlation is moderate (2).
PO2: Analyze (L4)
CO 4 Action verb is greater than PO2 verb by one level; Therefore correlation is moderate (2).
PO3: Design
CO 4 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).
PO4: Design
CO 4 Action verb is less than PO3 verb by one level; Therefore correlation is moderate (2).
PO6: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO6 as High (3)
PO11: Action verb Evaluate is of BTL 5. Using Thumb rule, L5 correlates PO11 as High (3)

CO 5: Analyze the Bore Hole data and Field data

Action Verb: Analyze (L4)

PO1: Apply(L3)
CO 5 Action verb is greater than PO1 verb. Therefore the correlation is high (3)
PO2: Analyze (L4)
CO 5 Action verb is equal to PO2 verb. Therefore the correlation is high (3)
PO 4: Analysis (L4)
CO 5 Action Verb is equal to PO4; Therefore correlation is high (3)
CO 5 Action Verb Analyze is of BTL 4. Using Thumb rule, L4 correlates PO6 as moderate (3).

II Year B.Tech. CE **II Semester**

Subject Code	Subject Name	L	T	P	CREDITS
23ASC9901	**SOFT SKILLS LAB**	**0**	**1**	**2**	**2**

Course Outcomes: After studying the course, students 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 the critical 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 behavior in workplace environment.

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms 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

TEXT BOOKS:
1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, 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, Renu Shorey) 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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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					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).

II YEAR **II SEMESTER**

Subject Code	Subject Name	L	T	P	CREDITS
23AES0304	DESIGN THINKING & INNOVATION	1	0	2	2

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

CO1:	Understand the concepts and principles of design thinking process.
CO2:	Apply the design thinking techniques for solving problems in various sectors.
CO3:	Analyze the art of innovation & creativity in product development
CO4:	Apply the design guidelines for produced development.
CO5:	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, historyof 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, brainstorming, product development

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

Unit III

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. Tim Brown, Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritina holden, Jill Butter.
4. Chesbrough. H, The Era of Open Innovation – 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

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	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

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	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 PO3 PO6	Apply (L3) Identify (L3) Develop (L3) Thumb Rule	3 3 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.
PO1 Verb: **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)
PO1 Verb: **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)
PO1 Verb: **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 CO4 co-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)
PO1 Verb: **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)

II YEAR **II SEMESTER**

Subject Code	Subject Name	L	T	P	CREDITS
23AMC9901	Environmental Science	**2**	**0**	**0**	**-**

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

CO1:	Understand the multidisciplinary nature of environmental studies, various renewable and nonrenewable resources.
CO2:	Understand the ecosystem and biodiversity to solve complex environmental problems
CO3:	Apply the various types of pollution, solid waste management, and related preventive measures
CO4:	Apply the rainwater harvesting, watershed management, ozone layer depletion, and wasteland reclamation.
CO5:	Understand the population explosion

CO	Action Verb	Knowledge Statement	Condition	Criteria	Blooms level
1	Understand	the multidisciplinary nature of environmental studies, various renewable and nonrenewable resources.			L2
2	Understand	the ecosystem and biodiversity	to solve complex environmental problems		L2
3	Apply	the various types of pollution, solid waste management, and related preventive measures			L3
4	Apply	the rainwater harvesting, watershed management, ozone layer depletion, and wasteland reclamation			L3
5	Understand	Population explosion			L2

UNIT – I

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 overutilization 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

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

Environmental Pollution: Definition, Causes, effects and its controlmeasures 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: earthquakes, cyclones, tsunamis, and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, Rainwater 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

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programs. – 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..

TEXTBOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

REFERENCES:

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, “Environmental Sciences and Engineering”, Prentice hall of India Private limited
5. G.R.Chatwal, “A Text Book of Environmental Studies” Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, “Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

CORRELATION OF COS WITH THE POS & PSOS:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
1						2	2						
2							2						
3						2	2						
4						2	2						
5							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 PO1 to PO11)	Level of Correlation (0-3)
	Register (Hrs)	Lesson Plan (Hrs)	%	corr	Verb	BTL			
1	**10**	**12**	23	3	Understand	**L2**	PO6 PO7	Thumb Rule Thumb Rule	2 2
2	**15**	**15**	28	3	Understand	**L2**	PO7	Thumb Rule	2 2
3	**8**	**8**	15	2	Apply	**L3**	PO6 PO7	Thumb Rule Thumb Rule	2 2
4	**9**	**10**	19	2	Apply	**L3**	PO6 PO7	Thumb Rule Thumb Rule	2 2
5	**8**	**8**	15	2	**Understand**	**L2**	PO7	Thumb Rule	2 2
	50	**53**	**100**						

JUSTIFICATION STATEMENTS:

CO1: Understand the multidisciplinary nature of environmental studies, various renewable and nonrenewable resources.
Action Verb: Understand (L2)
Using Thumb rule, CO1correlatesPO6 and PO7 as a moderate (2)

CO2: Understand the ecosystem and biodiversity to solve complex environmental problems
Action Verb: Understand (L2)
Using Thumb rule, CO2 correlates PO7 as a moderate (2)
CO3: Apply the various types of pollution, solid waste management, and related preventive measures
Action Verb: APPLY (L3)
Using Thumb rule, CO3 correlates PO6 and PO7 as a moderate (2)

CO4: Apply the rainwater harvesting, watershed management, ozone layer depletion, and wasteland reclamation.
Action Verb: APPLY (L3)
Using Thumb rule,CO4 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)

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.

- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law & Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy
        - Internet
        - Free Electricity
        - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development

- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should beensured.

For Engineering Students

1. Water facilities and drinking water availability

2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling lvel- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films

6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmesto be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. **Community Immersion Programme (Three Weeks)**

   Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. **Community Exit Report (One Week)**
   - During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.