



**GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE
(AUTONOMOUS)**

NELLORE-524317 (A.P) INDIA

**B.TECH – CIVIL ENGINEERING
COURSE STRUCTURE AND SYLLABI
UNDER
RG 23 REGULATIONS**

Member Secretary

Head of the Department,
Dept. of Civil Engineering
**GEETHANJALI INSTITUTE OF
SCIENCE & TECHNOLOGY**
GANGAVARAM (V), Kovur (M),
S.P.S.R. Nellore Dt. A.P. Pin - 524 132.

CE-HOD



GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade, Accredited by NBA (B.Tech., -ECE, EEE & Mech : 2024-2027

(Approved by AICTE & and UGC, New Delhi & Affiliated to JNTUA, Anantapur.)

3rd Mile, Nellore - Bombay Highway, Gangavaram (V), Kovur (M), S.P.S.R. Nellore Dt, Andhra Pradesh - India. 524 137

website: gist.edu.in / e-mail: geethanjali@gist.edu.in.



DEPARTMENT OF CIVIL ENGINEERING

VISION

To emerge as a learning resource-center producing accomplished civil engineers with strong ethical foundations & social values.

MISSION

M1: Adopting Conceptual and practical-oriented teaching-learning approaches in the civil engineering stream

M2: Arranging skill-based training through advanced and sustainable technologies.

M3: Organizing technical activities and promoting professional and interpersonal skills.

M4: Creating a conducive learning environment for enhancing environmental consciousness besides inculcating ethical values.

Program Educational Objectives (PEOs)

After few years of graduation, the graduates of B.Tech. (CE) will be:

PEO-1: Gain proficiency in the fundamentals civil engineering concepts aligned with mathematical and computational skills relevant to civil engineering.

PEO-2: Build successful professional careers as practicing civil engineers as well as in allied streams leveraging their technical expertise, communication ability and leadership attributes

PEO-3: Engage actively in life-long learning process constantly updating and upgrading their technical capabilities through higher studies.

PEO-4: Develop team spirit in effective execution of Civil engineering projects.

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Program Outcomes

On successful completion of the Program, the graduates of B.Tech. (CE) Program will be able to:

PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1 Provide practical and pragmatic solutions to the real time problems in the civil engineering stream

PSO2 Draw unsophisticated designs for construction projects using relevant Software tools keeping place with latest Civil Engineering trends.

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B.TECH Civil Engineering

RG – 23 Course Structure & Syllabus

(Applicable from the academic year 2023-24 onwards)

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 Counselling	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 mathematical skills	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

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B. Tech I Year I Semester (Theory-5, Lab-4)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	BS	23A0003T	Engineering Physics	3	0	0	3
2.	BS	23A0001T	Linear Algebra & Calculus	3	0	0	3
3.	ES	23A0201T	Basic Electrical & Electronics Engineering	3	0	0	3
4.	ES	23A0301T	Engineering Graphics	1	0	4	3
5.	ES	23A0501T	Introduction to Programming	3	0	0	3
6.	ES	23A0503P	IT Workshop	0	0	2	1
7.	BS	23A0006P	Engineering Physics Lab	0	0	2	1
8.	ES	23A0202P	Electrical & Electronics Engineering Workshop	0	0	3	1.5
9.	ES	23A0502P	Computer Programming Lab	0	0	3	1.5
10	BS&H	23ANSG01P	NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
Total credits							20.5

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B. Tech I Year II Semester (Theory-5, Lab-4)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BS	23A0009T	Communicative English	2	0	0	2
2	BS	23A0005T	Engineering Chemistry	3	0	0	3
3	ES	23A0002T	Differential Equations & Vector Calculus	3	0	0	3
4	ES	23A0101T	Basic Civil & Mechanical Engineering	3	0	0	3
5	PC	23A0303T	Engineering Mechanics	3	0	0	3
6	BS	23A00010P	Communicative English Lab	0	0	2	1
7	BS	23A0008P	Engineering Chemistry/Chemistry/ Fundamental Chemistry Lab	0	0	2	1
8	ES	23A0302P	Engineering Workshop	0	0	3	1.5
9	PC	23A0102P	Engineering Mechanics & Building Practices Lab	0	0	3	1.5
10	BS&HM	23AYG01P	Health and wellness, Yoga and Sports	-	-	1	0.5
Total credits							19.5

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B. Tech II Year I Semester (Theory-5, Lab-2, SEC-1,AC-1)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1.	BS	23A0011T	Numerical and Statistical Methods	3	0	0	3
2.	HM	23A0021T	Universal Human Values– Understanding Harmony & Ethical Human Conduct	2	1	0	3
3.	ES	23A0103T	Surveying	3	0	0	3
4.	PC	23A0104T	Strength of Materials	3	0	0	3
5.	PC	23A0105T	Fluid Mechanics	3	0	0	3
6.	PC	23A0106P	Surveying Lab	0	0	3	1.5
7.	PC	23A0107P	Strength of Materials Lab	0	0	3	1.5
8.	SEC	23A0108P	Building Planning and Drawing	0	1	2	2
9.	AC	23A0109T	Environmental Science	2	0	0	-
Total				16	02	08	20

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B. Tech II Year II Semester ((Theory-6, Lab-2, SEC-1)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1.	HM	23A0022T	Managerial Economics and Financial Analysis	2	0	0	2
2.	ES	23A0110T	Engineering Geology	3	0	0	3
3.	PC	23A0111T	Concrete Technology	3	0	0	3
4.	PC	23A0112T	Structural Analysis	3	0	0	3
5.	PC	23A0113T	Hydraulics &Hydraulic Machinery	3	0	0	3
6.	PC	23A0114P	Concrete Technology Lab	0	0	3	1.5
7.	PC	23A0115P	Engineering Geology lab	0	0	3	1.5
8.	SEC	23A0026P	Soft Skills	0	1	2	2
9.	ES	23A0413T	Design Thinking & Innovation	1	0	2	2
Total				15	1	10	21
Mandatory Community Service Project Internship of 08weeks duration during summer vacation							

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B. Tech III Year I Semester (Theory-5, Lab-2, SEC-1)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	PC	23A0116T	Water Resources Engineering	3	0	0	3
2.	PC	23A0117T	Design of Reinforced Concrete Structures	3	0	0	3
3.	PC	23A0118T	Geotechnical Engineering	3	0	0	3
4.	PE		Professional Elective-I	3	0	0	3
5.	OE		Open Elective-I	3	0	0	3
6.	MC	23A0522T	Introduction to Quantum Technology and Applications	3	0	0	3
7.	PC	23A0122P	Geotechnical Engineering Lab	0	0	3	1.5
8.	PC	23A0123P	Fluid Mechanics Hydraulic Machines Lab	0	0	3	1.5
9.	SEC	23A0124P	Estimation, Specifications, Costing & Valuation	0	1	2	2
10.	ES	23A0420P	Tinkering Lab	0	0	2	1
11.	PR	23A0145P	Evaluation of Community Service Internship	-	-	-	2
Total				18	01	10	26

S. No.	Course Code	Name of the Professional Elective
1	23A0119T	Pre-stressed Concrete
2	23A0120T	Air Pollution and Control
3	23A0121T	Environmental Impact Assessment

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S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0442T	Electronic Circuits	ECE
2.	23A0222T	Electrical Safety Practices and Standards	EEE
3.	23A0319T	Sustainable Energy Technologies	MECH
4.	23A0545T	Java Programming	CSE & Allied/IT
5.	23A0546T	Fundamentals of Artificial Intelligence	
6.	23A0547T	Quantum Technology & Applications	
7.	23A0027T	Mathematics for Machine Learning and AI	Mathematics
8.	23A0034T	Materials Characterization Techniques	Physics
9.	23A0040T	Chemistry of Energy Systems	Chemistry
10.	23A0044T	English for Competitive Examinations	Humanities
11.	23A0051T	Entrepreneurship and New Venture Creation	

Note:

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

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B. Tech III Year II Semester (Theory-6, Lab-2, SEC-1)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1.	PC	23A0125T	Design of Steel Structures	3	0	0	3
2.	PC	23A0126T	Highway Engineering	3	0	0	3
3.	PC	23A0127T	Environmental Engineering	3	0	0	3
4.	PE		Professional Elective-II	3	0	0	3
5.	PE		Professional Elective-III	3	0	0	3
6.	OE		Open Elective-II	3	0	0	3
7.	PC	23A0134P	Highway Engineering Lab	0	0	3	1.5
8.	PC	23A0135P	Environmental Engineering Lab	0	0	3	1.5
9.	SEC	23A0136P	Skill oriented course Building Information Modelling	0	1	2	2
10.	MC	23A0053T	Mandatory non credit course Technical paper writing & IPR	2	0	0	-
Total				20	01	08	23
Mandatory Industry Internship of 08 weeks duration during summer vacation							

S. No.	Course Code	Name of the Professional Elective
1	23A0128T	Design of Earthquake Resistant Structures
2	23A0129T	Open Channel Flow
3	23A0130T	Foundation Engineering
4	23A0131T	Cost effective Housing Techniques
5	23A0132T	Watershed Management
6	23A0133T	Advanced Structural Analysis

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S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0443T	Digital Electronics	ECE
2.	23A0232T	Renewable Energy Sources	EEE
3.	23A0334Tb	Automation and Robotics	MECH
4.	23A0548T	Fundamentals of Operating Systems	CSE & Allied/IT
5.	23A0529T	Machine Learning	
6.	23A0030T	Optimization Techniques	Mathematics
7.	23A0029T	Mathematical Foundation Of Quantum Technologies	
8.	23A0035T	Physics Of Electronic Materials And Devices	Physics
9.	23A0041T	Chemistry Of Polymers And Applications	Chemistry
10.	23A0045T	Academic Writing and Public Speaking	Humanities

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B. Tech IV Year I Semester (Theory-6, Lab-2, SEC-1)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	PC	23A0137T	Finite Element Methods	3	0	0	3
2.	ME		Management Course-II	2	0	0	2
3.	PE		Professional Elective-IV	3	0	0	3
4.	PE		Professional Elective-V	3	0	0	3
5.	OE		Open Elective-III	3	0	0	3
6.	OE		Open Elective-IV	3	0	0	3
7.	SEC	23A0144P	Skills in Civil Engineering software (STAADPRO/CAD/TEKL)	0	1	2	2
8.	MC	23A0054T	Gender Sensitization	2	0	0	-
9.	PR	(23A0146P)	Evaluation of Industry Internship	-	-	-	2
Total				19	01	02	21

S. No.	Course Code	Name of the Management Course
1	23A0049T	Business Ethics and Corporate Governance
2	23A0050T	E-Business
3	23A0048T	Management Science

S. No.	Course Code	Name of the Professional Elective
1	23A0138T	Geo-synthetics and Reinforced Earth Structures
2	23A0139T	Railways, Airports, Docks and Harbour Engineering
3	23A0140T	Experimental Stress Analysis
4	23A0141T	Ground Improvement Techniques
5	23A0142T	Subsurface Investigation and Instrumentation
6	23A0143T	Transportation Economics

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S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0416T	Introduction to Microprocessors and Microcontrollers	ECE
2.	23A0241T	Smart Grid Technologies	EEE
3.	23A0335T	3D Printing Technologies	MECH
4.	23A0512T	Data Base Management Systems	CSE & Allied/IT
5.	23A0532Tb	Cyber Security	
6.	23A0031T	Wavelet transforms and its Applications	Mathematics
7.	23A0036T	Smart Materials And Devices	Physics
8.	23A0037T	Introduction to Quantum Mechanics	
9.	23A0042T	Green Chemistry And Catalysis For Sustainable Environment	Chemistry
10.	23A0046T	Employability Skills	Humanities
11.	23A0444T	Transducers and Sensors	ECE
12.	23A0242T	Electric Vehicles	EEE
13.	23A0334Td	Total Quality Management	MECH
14.	23A0520T	Computer Networks & Internet Protocols	CSE & Allied/IT
15.	23A0450T	Internet of Things	
16.	23A3315a	Introduction to Quantum Computing	
17.	23A0032T	Financial Mathematics	Mathematics
18.	23A0038T	Sensors And Actuators for Engineering Applications	Physics
19.	23A0043T	Chemistry Of Nano materials And Applications	Chemistry
20.	23A0047T	Literary Vibes	Humanities

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B. Tech IV Year II Semester

Sl.No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1.	Major Project	23A0147P	Internship	-	-	-	4
			Project	-	-	-	8
			Total credits				12

Member Secretary

Head of the Department,
Dept. of Civil Engineering
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Open Elective courses offered by CE Dep

Year-Sem	Course code	Open Elective
III-I (OE-I)	23A0148T	Green Buildings
	23A0149T	Construction Technology and Management
III-II (OE-II)	23A0150T	Disaster Management
	23A0151T	Sustainability in Engineering Practices
IV-I (OE-III)	23A0152T	Building Materials and Services
	23A0121T	Environmental Impact Assessment
IV-I (OE-IV)	23A0153T	Geo-Spatial Technologies
	23A0154T	Solid Waste Management

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COURSES OFFERED FOR HONORS DEGREE IN CIVIL ENGINEERING

S.No	Course Code	Course Title	Contact Hours per week			Credits
			L	T	P	
1	23A0155T	Soil Dynamics and Machine Foundation	3	0	0	3
2	23A0156T	Industrial Waste and Waste Water Management	3	0	0	3
3	23A0157T	Repair & Rehabilitation of Structures	3	0	0	3
4	23A0158T	Design and Drawing of Irrigation Structures	3	0	0	3
5	23A0159T	Road Safety Engineering	3	0	0	3
6	23A0160P	NDT Lab	0	0	3	1.5
7	23A0161P	ETABS/SAP Lab	0	0	3	1.5
Total						18

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LIST OF MINORS OFFERED BY THE CIVIL ENGINEERING BUILDING PLANNING & CONSTRUCTION TECHNOLOGY

S.No	Course Code	Course Title	Contact Hours per week			Credits
			L	T	P	
1	23A0162T	Construction Materials	3	-	0	3
2	23A0163T	Construction Methods	3	-	0	3
3	23A0164T	Building Planning And Drawing	3	-	0	3
4	23A0165T	Surveying	3	-	0	3
5	23A0166T	Concrete Technology	3	-	0	3
6	23A0167P	Concrete Technology Lab	0	0	3	1.5
7	23A0168P	Surveying Lab	0	0	3	1.5
Total						18

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LIST OF MINORS OFFERED TO CIVIL ENGINEERING

S.No	Minor Title	Department offering the Minor
1	Micro Grid Technology	EEE
2	Energy Systems	
3	3D Printing	ME
4	Industrial Engineering	
5	Embedded Systems and IoT	ECE & VLSI
6	Electronic Systems	
7	Computer Science and Engineering	CSE & Allied
8	Cyber Security	
9	Internet of Things	
10	Data Science	
11	Artificial Intelligence & Machine Learning	
12	Data Analytics	
13	Data Science and Analytics	
14	Programming & Computational Intelligence	
15	AI Applications & Emerging Technologies	
16	Quantum Computing	
17	Quantum Technologies	

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B.Tech. I Year I Semester

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	BS	23A0003T	Engineering Physics	3	0	0	3
2	BS	23A0001T	Linear Algebra & Calculus	3	0	0	3
3	ES	23A0201T	Basic Electrical & Electronics Engineering	3	0	0	3
4	ES	23A0301T	Engineering Graphics	1	0	4	3
5	ES	23A0501T	Introduction to Programming	3	0	0	3
6	ES	23A0503P	IT Workshop	0	0	2	1
7	BS	23A0006P	Engineering Physics Lab	0	0	2	1
8	ES	23A0202P	Electronics Engineering Workshop	0	0	3	1.5
9	ES	23A0502P	Computer Programming Lab	0	0	3	1.5
10	BS&H	23ANSG01P	NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
Total Credits							20.5

Category	CREDITS
Basic Science course (BSC)	7.5
Engineering Science Courses (ESC)	13
Humanities and social science (HSMC)	-
TOTALCREDITS	20.5


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B.Tech. I Year I Semester

ENGINEERING PHYSICS

(Common to all branches)

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0003T	3 : 0 : 0:0	3	CIE: 30 EE:70	3 Hours	BS

Prerequisite: Student should know about fundamental and basic principles in physics

Course Objectives:

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

Course Outcomes:

On completion of this course, the students are able to:-

CO1: Analyse the intensity variation of light due to polarization, interference and diffraction.

CO2: Familiarize with the basics of crystals and their structures.

CO3: Summarize various types of polarization of dielectrics and classify the magnetic materials.

CO4: Apply fundamentals of quantum mechanics to band theory of solids.

CO5: Identify the type of semiconductor using Hall effect.

SYLLABUS

Total Hours:48

Unit- I

WAVE OPTICS

10 Hrs

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

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates

Unit- II

CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

8 Hrs

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

Unit- III

DIELECTRIC AND MAGNETIC MATERIALS

10 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 - complex dielectric constant – Frequency dependence of polarization – dielectric loss



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Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials

Unit- IV

QUANTUM MECHANICS AND FREE ELECTRON THEORY

10 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.

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

Unit- V

SEMI CONDUCTORS

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.

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – High T_c superconductors– Applications of superconductors

Textbooks:

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

Reference Books:

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

E-resources:

- <https://www.textbooks.com/Catalog/MG5/Applied-Physics.php>
- https://edurev.in/courses/9596_Electromagnetic-Theory-Notes--Videos--MCQs--PPTs
- <https://libguides.ntu.edu.sg/c.php?g=867756&p=6226561>
- <https://bookauthority.org/books/best-applied-physics-books>
- <https://www.electronicsforu.com/resources/16-free-ebooks-on-material-science/2>



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B.Tech. I Year I Semester

LINEAR ALGEBRA & CALCULUS (Common to All Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0001T	3:0:0:0	3	CIE:30 SEE:70	3Hours	BS

Course Objectives:

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

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

CO1: Solving systems of linear equations that is needed by engineers for practical applications.

CO2: Find the Eigen values and Eigen vectors to facilitate the calculation of matrix characteristics.

CO3: Utilize mean value theorems to real life problems.

CO4: Apply the technique of partial differentiation to find the Jacobian and the extreme values of functions of several variables.

CO5: Apply the techniques of multiple integrals to find the areas and volumes.

Syllabus

Total Hours:45

Unit-I	MATRICES	9Hrs
Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous eq uations - Gauss elimination method, Iteration Methods: Gauss- Jacobi and Gauss Seidel Iteration Methods. Applications: Finding the current in electrical circuits.		
Unit-II	EIGEN VALUES, EIGEN VECTORS AND ORTHOGONAL TRANSFORMATION	9Hrs
Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.		
Unit-III	CALCULUS	9Hrs
Mean Value Theorems: Rolle's Theorem (Without Proof), Lagrange's mean value theorem (Without Proof) with their geometrical interpretation, Cauchy's mean value theorem (Without Proof), 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)	9Hrs
Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.		
Unit-V	MULTIPLE INTEGRALS (MULTI VARIABLE CALCULUS)	9Hrs
Double integrals, triple integrals, change of order of integration (Cartesian Coordinate only), change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals)		

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition



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2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

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



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B.Tech. I Year I Semester

BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to All branches of Engineering)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0201T	3:0:0:0	3	CIE:30 & SEE:70	3 Hours	ES

Course Objectives:

The objectives of the course are to make the students learn about:

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

Course Outcomes (CO):

At the end of studying the course, the student should be able to:

CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.

CO2: Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.

CO3: Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.

CO4: Analyse different electrical circuits, performance of machines and measuring instruments.

CO5: Evaluate different circuit configurations, Machine performance and Power systems operation

Syllabus	PART A: BASIC ELECTRICAL ENGINEERING	Total Hours: 48
Unit-I	DC & AC Circuits	10Hrs
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	8Hrs
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	6Hrs
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,		



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calculation of electricity bill for domestic consumers.

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

Textbooks:

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

Reference Books:

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

Web Resources:

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

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

The objectives of the course are to make the students learn about:

- This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

Course Outcomes (CO):

At the end of studying the course, the student should be able to:

CO1: Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.

CO2: Explain the characteristics of diodes and transistors.

CO3: Familiarize with the number systems, codes, Boolean algebra and logic gates.

CO4: Understand the working mechanism of different combinational, sequential circuits and their role in the digital systems

Syllabus		Total Hours: 48
Unit-I	SEMICONDUCTOR DEVICES	6Hrs
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 INSTRUMENTATION	10Hrs
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	8Hrs

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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&LouisNashlesky,ElectronicDevices&CircuitTheory,PearsonEducatio
2. R. P.Jain, Modern Digital Electronics, 4thEdition,TataMcGrawHill, 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



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B.Tech. I Year I Semester

ENGINEERING GRAPHICS

(Common to All Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0301T	3:0:0:0	3	CIE:30 SEE:70	3Hours	ES

Course Objectives:

The students completing the course are expected to:

- Understand the basic principles and conventions of engineering drawing use engineering instruments and draw engineering curves.
- Use orthographic projections and make the students draw the projections of lines and planes inclined to both the planes.
- Draw the projections of the solids in different positions with respect to the reference planes.
- Understand the importance of sectioning and concept of development of surfaces.
- Represent and convert isometric views to orthographic views and vice versa

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

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.

CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.

CO3: Understand and apply concepts of sectional view store present details of solids in simple positions.

CO4: Gain a clear understanding of the principles behind development of surfaces and to understand how to unfold basic geometric shapes into flat patterns.

CO5: Develop the ability to draw isometric views and orthographic views and should be able to convert isometric views to orthographic views and vice versa.

Syllabus		Total Hours:45
Unit-I	INTRODUCTION	9Hrs
Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.		
Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutives, Normal and tangent to Curves.		
Scales: Plain scales, diagonal scales and vernier scales.		
Unit-II	ORTHOGRAPHIC PROJECTIONS	9Hrs
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	9Hrs
Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis		



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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 other and axes inclined to both the reference planes.

Unit-IV	SECTIONS OF SOLIDS	9Hrs
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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	9Hrs
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Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).

Textbooks:

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

Reference Books:

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



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B.Tech. I Year I Semester

INTRODUCTION TO PROGRAMMING (Common to All Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0501T	3:0:0:0	3	CIE:30 SEE:70	3Hours	ES

Course Objectives:

The students completing the course are expected to:

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

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

CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.

CO2: Analyse a problem and develop an algorithm to solve it.

CO3: Implement various algorithms using the C programming language.

CO4: Understand more advanced features of C language.

CO5: Develop problem-solving skills and the ability to debug and optimize the code.

Syllabus		Total Hours:48
Unit-I	INTRODUCTION TO PROGRAMMING AND PROBLEM SOLVING	10Hrs
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	8Hrs
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.		
Unit-III	ARRAYS AND STRINGS	10Hrs
Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings		
Unit-IV	POINTERS & USER DEFINED DATA TYPES	10Hrs
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	10Hrs



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Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Life time of Variables, command line arguments, Preprocessor directives, 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
2. Education, 2008.
3. Programming in C, Rema Theraja, Oxford, 2016, 2 nd edition
4. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3 rd edition



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B.Tech. I Year I Semester

IT WORKSHOP

(Common to All branches of Engineering)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0503P	0:0:2:0	1	CIE:30 &SEE:70	3 Hours	ES

Course Objectives:

This course will enable students to:

- CO1: Introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
CO2: Demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
CO3: Teach basic command line interface commands on Linux.
CO4: Teach the usage of Internet for productivity and self-paced life-long learning
CO5: Introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

List of Experiments:

Total Hours : 32

PC Hardware & Software Installation

- Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
- Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.
- Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
- Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.
- Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

- Task 1:** Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.
- Task 2:** Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
- Task 3:** Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.
- Task 4:** Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Task 5: Install any anti-virus software on your computer

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



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equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

2. **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.
3. **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.
4. **Task 4:** Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

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

1. **Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text
2. **Task 2:** Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

LOOKUP/VLOOKUP

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

POWER POINT

1. **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.
2. **Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.
3. **Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

1. **Task 1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
 - Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
2. **Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
 - Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."
3. **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.

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- 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



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B.Tech. I Year I Semester

ENGINEERING PHYSICS LAB (Common to All branches of Engineering)

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0006P	0 : 0 : 2 :0	1	CIE: 30 EE:70	3 Hours	BS

Prerequisite: Student should know about fundamental and basic principles in physics

Course Objectives:

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

Course Outcomes

On completion of this course, the students are able to:-

- CO1: Operate optical instruments like travelling microscope and spectrometer.
- CO2: Estimate dielectric constant of capacitor and magnetic induction of current carrying coil
- CO3: Identify the type of semiconductor and calculate band gap of it.
- CO4: Evaluate different modulus of materials.
- CO5: Measure the frequency of tuning fork and verify the laws in Sonometer.

SYLLABUS

Total Hours : 32

List of Experiments:

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



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17. Sonometer : Verification of laws of stretched string.

18. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.

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

References Books:

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

URL: www.vlab.co.in



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B.Tech. I Year I Semester

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP (Common to All branches of Engineering)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0202P	0:0:3:0	1.5	CIE:30 &SEE:70	3 Hours	ES

Course Objectives:

This course will enable students to:

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

Course Outcomes (CO):

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

CO1: Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.

CO2: Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.

CO3: Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.

CO4: Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.

CO5: Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

List of Experiments:(Any 10 experiments from the above list)

Total Hours : 32

1. Transient analysis of given electrical network
2. Simulation of 1-phase and 3-phase transformers
3. Study of the dynamics of second **order system**
4. Implementation of buck and boost dc-dc converters
5. Study on the design of PI controllers and stability analysis for a DC-DC buck Converter
6. Sine-PWM techniques for single-phase half-bridge, full-bridge and three-phase inverters
7. Economic Load Dispatch of (i) Thermal Units and (ii) Thermal Plants using Conventional method
8. Transient Stability Analysis of Power Systems using Equal Area Criterion (EAC)
9. Reactive Power Control in a transmission system (Ferranti effect, Effect of shunt Inductor)
10. Fault studies using Zbus matrix
11. Design of virtual PMU
12. Wide area control of Two area **Kundur system**

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
 - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.



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- Provide some exercises so that measuring instruments are learned to be used by the students
3. Components:
- Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
 - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments



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B.Tech. I Year I Semester

COMPUTER PROGRAMMING LAB (Common to All branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0502P	0 : 0: 3:0	1.5	CIE: 30 SEE:70	3Hours	ES

Course Objectives:

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

Course Outcomes:

On completion of this course, the students are able to:-

CO1: Read, understand, and trace the execution of programs written in C language.

CO2: Select the right control structure for solving the problem.

CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.

CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

SYLLABUS

Total Hours : 45

UNIT I

WEEK 1

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

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

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()

WEEK 2

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

Suggested Experiments /Activities:

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

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

Developing the algorithms/flowcharts for the following sample programs

- Sum and average of 3 numbers
- Conversion of Fahrenheit to Celsius and vice versa
- Simple interest calculation

WEEK 3

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

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

- Finding the square root of a given number
- Finding compound interest
- Area of a triangle using heron's formulae
- Distance travelled by an object



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UNIT II

WEEK 4

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

Suggested Experiments/Activities:

Tutorial 4: Operators and the precedence and as associativity:

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

- 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

WEEK 5

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

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

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

- 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

WEEK 6

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

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

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

- 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.

UNIT III

WEEK 7:

- i) Find the min and max of a 1-D integer array.
- ii) Perform linear search on 1D 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. **WEEK 8:**



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

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

- 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

UNIT IV

WEEK 9:

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

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

- 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()

WEEK 10:

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

Suggested Experiments/Activities:

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

Lab10 : Bitfields, linked lists

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

- 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.

UNIT V

WEEK 11:

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

Suggested Experiments/Activities:

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

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

- i) Write a C function to calculate NCR value.



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- 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

WEEK 12:

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

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

- 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.

WEEK 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

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

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

WEEK14:

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

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

- i) Write a C program to write and read text into a file.
- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.
- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print last n characters of a given file

Textbooks:

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

Reference Books:

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



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B.Tech. I Year I Semester

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
23ANSG01P	0: 0: 1: 0	0.5	100	-	BS&H

Course Objectives:

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

Course Outcomes(CO):

On completion of this course, student will be able to

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

Syllabus

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

Activities:

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

Module-II	Nature & Care
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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) Organising 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.

Module-III	Community Service
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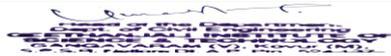
Activities:

- 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) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
- iii) Conducting consumer Awareness. Explaining various legal provisions etc.
- iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
- v) Any other programmes in collaboration with local charities, NGOs etc

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)*


Member Secretary


CE-HOD



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B.Tech. I Year II Semester

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	BS	23A0009T	Communicative English	2	0	0	2
2	BS	23A0005T	Engineering Chemistry	3	0	0	3
3	ES	23A0002T	Differential Equations & Vector Calculus	3	0	0	3
4	ES	23A0101T	Basic Civil & Mechanical Engineering	3	0	0	3
5	PC	23A0303T	Engineering Mechanics	3	0	0	3
6	BS	23A00010P	Communicative English Lab	0	0	2	1
7	BS	23A0008P	Engineering Chemistry/Chemistry/ Fundamental Chemistry Lab	0	0	2	1
8	ES	23A0302P	Engineering Workshop	0	0	3	1.5
9	PC	23A0102P	Engineering Mechanics & Building Practices Lab	0	0	3	1.5
10	BS&HM	23AYG01P	Health and wellness, Yoga and Sports	-	-	1	0.5
Total Credits							19.5

Category	CREDITS
Basic Science course (BS)	7.5
Engineering Science Courses (ES)	7.5
Professional Core Course (PC)	4.5
TOTALCREDITS	19.5

Member Secretary

Head of the Department,
 Dept. of Civil Engineering,
 GEETHANJALI INSTITUTE OF
 SCIENCE & TECHNOLOGY
 GANGAVARAM (V), Kovur (M),
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CE-HOD



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B.Tech. I Year II Semester

COMMUNICATIVE ENGLISH

(Common to all Branches of Engineering)

Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
23A009T	2: 0: 0: 0	2	CIE:30 SEE:70	3 Hours	BS

Course Objectives:

- Facilitate effective **listening skills** for better comprehension of academic lectures and English spoken by native speakers
- Help improve **speaking skills** motivating the learners to participate in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate **reading skills** for comprehension of various academic texts and authentic materials
- Impart effective strategies for good **writing skills** in summarizing, writing well organized essays, drafting formal letters and designing well structured reports
- Broaden the knowledge base of **grammatical structures** and **vocabulary** and encourage their appropriate use in speech and writing

Course Outcomes(CO):

On completion of this course, student will be able to

CO1: The learner will be able to speak and write grammatically accurate sentences through applications of principles of English grammar

CO2: The learner will enhance vocabulary skills to build strong language skills.

CO3: The learner acquires the ability to understand the academic text from multiple dimensions employing ethical and logical reasoning based on accurate comprehension

CO4: The learner gains evaluation potential by employing standard reading & listening strategies to grasp the core essence and spirit of the text

CO5: The learner will gain mastery on speaking & writing skills through the application of relevant guidelines, through consistent practice of functional English expression

Syllabus		Total Hours:32
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Module-I	HUMAN VALUES: Gift of Magi (Short Story)	8Hrs
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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.

Module-II	The Brook by Alfred Tennyson (Poem)	7Hrs
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Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

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



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Module-III	BIOGRAPHY: Elon Musk	6 Hrs
<p>Listening: Listening for global comprehension and summarizing what is listened to.; Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed; Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.; Writing: Summarizing, Note-making, paraphrasing; Grammar: Verbs - tenses; subject-verb agreement; Compound words, Vocabulary: Compound words, Collocations</p>		
Module-IV	INSPIRATION: The Toys of Peace -Saki	6 Hrs
<p>Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.; Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.; Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data; Writing: Letter Writing: Official Letters, Resumes; Grammar : Reporting verbs, Direct & Indirect speech, Active & Passive Voice; Vocabulary: Words often confused, Jargons</p>		
Module-V	MOTIVATION: The Power of Intrapersonal Communication (An Essay)	5 Hrs
<p>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 for Comprehension; Writing: Writing structured essays on specific topics. ;Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement); Vocabulary: Technical Jargons</p>		
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		



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B.Tech. I Year II Semester

ENGINEERING CHEMISTRY (Common to ME and CE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0005T	3:0:0:0	3	CIE:30 SEE:70	3Hours	BS

Prerequisite: Student should know fundamental concepts about Engineering Chemistry

Course Objectives:

This course will enable students to:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, and cement

Syllabus

Total Hours:48

Unit-I

WATER TECHNOLOGY

10Hrs

Soft and hard water, Estimation of hardness of water by complexometry (EDTA Method), Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Purification of water: **Zeolite process**, Ion-exchange processes - desalination of brackish water by Reverse Osmosis (RO) and electro dialysis; Specifications for safe drinking water as per the Bureau of Indian Standards (BIS) and World Health Organization (WHO) standards, Industrial water treatment

Unit-II

ELECTROCHEMISTRY AND APPLICATIONS

10Hrs

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 electrochemical 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

10Hrs

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization, Polydispersity Index (PDI).

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-biodiesel.

Unit-IV

MODERN ENGINEERING MATERIALS

8Hrs

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 number and applications.

Building materials- Portland Cement, constituents, Setting and Hardening of cement (Chemical reactions involved).



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Unit-V	SURFACE CHEMISTRY AND NANOMATERIALS	9Hrs
<p>Introduction to surface chemistry, colloids, nanometal and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometal and metal oxides, stabilization of colloids and nonmaterial's by stabilizing agents. Adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation) applications of colloids and nonmaterial's – catalysis, medicine, sensors, etc.</p>		
<p>Course Outcomes (CO):</p> <p>On completion of this course, student will be able to</p> <ol style="list-style-type: none"> 1. Describe the basic properties of water and its significance in domestic and industrial purposes.(L2) 2. Analyse the principles of electrochemistry in batteries and fuel cells and corrosion prevention methods that are useful to know about the protection of metals. (L3) 3. Describe advanced polymer materials and their industrial applications and know about calorific values, octane number, refining of petroleum and cracking of oils. (L2) 4. Define various types of engineering materials and their applications in the industry. (L1) 5. Summarize the concepts of colloids, micelle and nano-materials .(L2) <p>Textbooks:</p> <ol style="list-style-type: none"> 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. 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020. 2. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997. 3. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992. 		



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B.Tech. I Year II Semester

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to All Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0002T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	ES

Course Objectives:

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

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

CO1: Solve the first order differential equations related to various engineering fields.

CO2: Solve the linear differential equations of higher order with constant coefficients

CO3: Identify solution methods for partial differential equations that model physical processes.

CO4: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO5: Apply Green's, Stokes and Divergence theorem in work done, circulation, flux and triple integrals.

Syllabus **Total Hours: 45**

Unit-I	DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE	9Hrs
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Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling – Law of natural growth and decay Electrical circuits.

Unit-II	LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)	9Hrs
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Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

Unit-III	PARTIAL DIFFERENTIAL EQUATIONS	9Hrs
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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	9Hrs
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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	9Hrs
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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 related problems

Textbooks:

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



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B.Tech. I Year II Semester

BASIC CIVIL & MECHANICAL ENGINEERING (Common for all branches)

Course Code	L:T:P:S	Credits	Exam. Marks	Exam Duration	Course Type
23A0101T	3:0:0:0	3	CIE:30 SEE:70	3Hours	ES

Course Objectives:

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

Syllabus	PART-A	Total Hours:24
Unit-I		8 Hrs

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	8 Hrs
Fluid Mechanics: Properties of fluids and types of fluids.; Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping	

Fluid Mechanics: Properties of fluids and types of fluids.; 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	8 Hrs
Transportation Engineering Importance of Transportation in Nations economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements -Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.	

Transportation Engineering Importance of Transportation in Nations economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements -Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.
Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology-Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Text Books:

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

Reference Books:

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

E-Resources : <https://archive.nptel.ac.in/courses/105/106/105106201/>



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PART-B BASIC MECHANICAL ENGINEERING

Course Objectives:

The students after completing the course are expected to

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

Syllabus	TotalHours:24
Unit-I	8 Hrs
<p>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.</p> <p>Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.</p>	
Unit-II	8 Hrs
<p>Manufacturing Processes: Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.</p> <p>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..</p>	
Unit-III	8 Hrs
<p>Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.</p> <p>Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.</p> <p>Introduction to Robotics - Joints & links, configurations, and applications of robotics. (Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject).</p>	
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd. 2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd. 3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd. 	
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I 2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar Pulak M Pandey, Springer publications 3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd. <p>G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical</p>	



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

CO1: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying

CO2: Realize the importance of Transportation in nations economy and the engineering measures related to highways in terms of geometrics.

CO3: Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.

CO4: Understand the different manufacturing processes.

CO5: Understand the basics of thermal engineering and its applications

CO6: Describe the working of different mechanical power transmission systems and power plants, learn basics of robotics.



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B.Tech. I Year II Semester

ENGINEERING MECHANICS (Common to CE & ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0303T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a body to Analyse the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

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

CO1: Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.

CO2: Analyse different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.

CO3: Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.

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

CO5: Solve the problems involving the translational and rotational motion of rigid bodies

Syllabus	Total Hours: 45
Unit-I	9Hrs
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's laws of dry friction, coefficient of friction, Cone of Static friction.	
Unit-II	9Hrs
Free Body Diagrams, Lami's Theorem, 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	9Hrs
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 gravity of composite bodies, Pappus theorems. Area Moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of 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 Moments of Inertia, Mass Moment of Inertia of composite bodies.	
Unit-IV	9Hrs



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

Unit-V

9Hrs

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 Hill Education 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 international publications 2018. 4th Edition

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and MA. Nelson., McGrawHill Education,2017.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., 4th Edition, PHI,2002.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam andL. G. Kraige., 6th Edition, John Wiley, 2008.
4. Engineering Mechanics: Principles of Statics and Dynamics, R.C. Hibbler., Pearson Press,2006.
5. Introduction to Statics and Dynamics, Andy Ruina and Rudra Pratap., Oxford University Press, 2011.



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B.Tech. I Year II Semester

COMMUNICATIVE ENGLISH LAB (Common to all Branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A00010P	0 : 0: 2:0	1	CIE: 30 SEE:70	3Hours	BS

Course Objectives:

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

Course Outcomes:

On completion of this course, the students are able to:-

CO1: Analyse the English speech sounds, stress, intonation for better Listening practice

CO2: Apply communication skills through various language learning activities

CO3: Application of writing skills through design and preparation of professional Resume & email writing

CO4: Create effective resonate and prepare themselves to face interviews in future

List of Experiments

Total Hours : 32

1. Vowels & Consonants
2. Neutralization/ Accent Rules
3. Communication Skills & Jam
4. Role Play Or Conversational Practice
5. Email Writing
6. Resume Writing, Cover Letter, Sop
7. Group Discussion-Methods & Practice
8. Debate - Method & Practice
9. PPT Presentation / Poster Presentation
10. Interview Skills

Suggested Software: Walden Infotech / Young India Films

Reference Books:

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Grant Taylor: English Conversation Practice, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. T. Balasubramanian, A Textbook of English Phonetics for Indian Students, (3rd Ed) Trinity Press.



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Online Learning Resources/Virtual Labs:

Spoken English:

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

Voice & Accent:

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2jc5Xwp_IA



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B.Tech. I Year II Semester

ENGINEERING CHEMISTRY LAB

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0008P	0 :0:2:0	1	CIE:30 SEE:70	3 Hours	BS

Course Objectives:

This course will enable students to:

- To Verify the fundamental concepts with experiments

Course Outcomes (CO):

On completion of this course, student will be able to

CO1: Measure the strength of an acid present in secondary battery and Determine the rate of corrosion for mild steel in hydrochloric acid medium

CO2: Determine the Hardness and DO of a water sample of different acid-base titrations by pH meter.

CO3: Synthesize of advanced polymer materials and nano materials.

CO4: Identify some organic and inorganic compounds by instrumental and volumetric methods.

CO5: Determine the viscosity of different lubricants using Redwood Viscometer and adsorption of acetic acid.

Syllabus	Total Hours:32
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List of Experiments

- Determination of Hardness of a groundwater sample by EDTA method.
- Estimation of Dissolved Oxygen by Winkler's method
- Determination of Strength of an acid in Pb-Acid battery
- Preparation of a polymer (Bakelite)
- Determination of percentage of Iron in Cement sample by colorimetry
- Estimation of Calcium in portland Cement by Volumetric method
- Preparation of nano-materials by precipitation method.
- Verification of Freundlich adsorption Isotherm (Adsorption of Acetic acid by charcoal).
- Determination of percentage Moisture content in a coal sample
- Determination of Viscosity of lubricating oil by Redwood Viscometer 1
- Determination of Viscosity of lubricating oil by Redwood Viscometer 2
- Determination of Calorific value of gases by Junker's gas Calorimeter
- Determination of Corrosion rate for mild steel in hydrochloric acid medium.
- pH metric titration of strong acid vs. strong base
- Determination alkalinity of water sample

Note: **out of 15 experiments conduct any 10 experiments**

Reference Books

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



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B.Tech. I Year II Semester

ENGINEERING WORKSHOP (Common to All branches of Engineering)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0302P	0 : 0: 3:0	1.5	CIE: 30 SEE:70	3Hours	ES

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills.

Course Outcomes:

On completion of this course, the students are able to:-

CO1: Identify workshop tools and their operational capabilities.

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.

CO3: Apply fitting operations in various applications.

CO4: Apply basic electrical engineering knowledge for House Wiring Practice.

SYLLABUS

Total Hours: 42

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

Textbooks:

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

Reference Books:

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



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B.Tech. I Year II Semester

ENGINEERING MECHANICS & BUILDING PRACTICES LAB (Civil Engineering & allied branches)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0102P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives:

This course will enable students to:

- Verify the Law of Parallelogram of Forces and Lami's theorem.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Understand the layout of a building, concepts of Non-Destructive Testing and different alternative Materials..

Course Outcomes:

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

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

CO2: Verify Law of Parallelogram of forces and Law of Moment using force polygon and bell crank lever.

CO3: Determine the Centre of gravity for different configurations

CO4: Understand the Quality Testing and Assessment Procedures and principles of Non-Destructive Testing.

CO5: Exposure to safety practices in the construction industry

Syllabus

TotalHours:48

Note: Students have to perform any 10 of the following Experiments

List of Experiments

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

Reference Book(s):

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, McGraw Hill Education.
2. Hibbeler R.C., Engineering Mechanics: StaticsandDynamics,14thEdition, Pearson Education,I nc., NewDelhi,2022
3. Concrete Technology: MS Shetty



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B.Tech. I Year II Semester

HEALTH AND WELLNESS, YOGA AND SPORTS (Common to all Branches of Engineering)

Course Code	L:T: P: S	Credits	Exam marks	Exam Duration	Course Type
23AYG01P	0: 0: 1: 0	0.5	100	-	BS

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(CO):

On completion of this course, student will be able to

- CO1: Understand the importance of yoga and sports for Physical fitness and sound health.
- CO2: Demonstrate an understanding of health-related fitness components.
- CO3: Compare and contrast various activities that help enhance their health.
- CO4: Assess current personal fitness levels.
- CO5: Develop Positive Personality

Syllabus

Module-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

Module-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

Module-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. 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


Member Secretary


CE-HOD



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B.Tech. II Year I Semester

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	BS	23A0011T	Numerical and Statistical Methods	3	0	0	3
2	HM	23A0021T	Universal Human Values–Understanding Harmony & Ethical Human Conduct	2	1	0	3
3	ES	23A0103T	Surveying	3	0	0	3
4	PC	23A0104T	Strength of Materials	3	0	0	3
5	PC	23A0105T	Fluid Mechanics	3	0	0	3
6	PC	23A0106P	Surveying Lab	0	0	3	1.5
7	PC	23A0107P	Strength of Materials Lab	0	0	3	1.5
8	SEC	23A0108P	Building Planning and Drawing	0	1	2	2
9	Audit Course	23A0109T	Environmental Science	2	0	0	-
Total Credits							20
Category			CREDITS				
Basic Science course (BS)			3				
Engineering Science Courses (ES)			3				
Professional Core Course (PC)			9				
Humanities and social science (HM)			3				
Skill Enhancement Course (SEC)			2				
TOTALCREDITS			20				

Member Secretary

Head of the Department,
Dept. of Civil Engineering
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B.Tech. II Year I Semester

NUMERICAL & STATISTICAL METHODS

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0011T	3 : 0 : 0:0	3	CIE: 30 EE:70	3 Hours	BS

Pre-requisite: Basic algebraic Equations, Probability, random variables (discrete and continuous) and probability distributions.

SYLLABUS

Total Hours:48

Unit- I

8 Hrs

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

10 Hrs

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

10 Hrs

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

10 Hrs

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

10 Hrs

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), χ^2 - test for goodness of fit, χ^2 - test for independence of attributes.

Textbooks:

1. S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition.
3. Miller and Freunds, Probability and Statistics for Engineers, 7/e, Pearson, 2008.India.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Ronald E. Walpole, Probability and Statistics for Engineers and Scientists, PNIE.
4. H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publications, 2014, Third Edition (Reprint 2021).



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E-resources:

- https://onlinecourses.nptel.ac.in/noc17_ma14/preview
- https://onlinecourses.nptel.ac.in/noc24_ma05/preview
- <http://nptel.ac.in/courses/111105090>

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Apply numerical methods to solve algebraic and transcendental equations	L2, L3
CO2	Derive interpolating polynomials using interpolation formulae	L3, L5
CO3	Solve differential and integral equations numerically	L3
CO4	To identify real life problems into Mathematical Models.	L2, L3
CO5	To apply the probability theory and testing of hypothesis in the field of civil engineering Applications.	L3, L5



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B.Tech. II Year I Semester

UNIVERSAL HUMAN VALUES-UNDERSTANDING HARMONY & ETHICAL HUMAN CONDUCT

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0021T	2 : 1 : 0:0	3	CIE: 30 SEE:70	3 Hours	HM

Course Objectives:

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

SYLLABUS

Total Hours:48

Unit- I

10 Hrs

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

Lecture 4: 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

Practice Sessions for

- Sharing about Oneself
- Exploring Human Consciousness
- Exploring Natural Acceptance

Unit- II

10 Hrs

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

Practice Sessions for

- Exploring the difference of Needs of self and body
- Exploring Sources of Imagination in the self
- Exploring Harmony of self with the body

Unit- III

10 Hrs



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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

Practice Sessions for

- Exploring the Feeling of Trust
- Exploring the Feeling of Respect
- Exploring Systems to fulfil Human Goal

Unit- IV

8 Hrs

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.

Practice Sessions for

- Exploring the Four Orders of Nature
- Exploring Co-existence in Existence

Unit- V

10 Hrs

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

Practice Sessions for

- Exploring Ethical Human Conduct
- Exploring Humanistic Models in Education
- 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



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Reference Books:

1. *Jeevan Vidya: Ek Parichaya*, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. *Human Values*, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth* - by Mohandas Karamchand Gandhi
5. *Small is Beautiful* - E. F Schumacher.
6. *Slow is Beautiful* - Cecile Andrews
7. *Economy of Permanence* - J C Kumarappa
8. *Bharat Mein Angreji Raj* – Pandit Sunderlal
9. *Rediscovering India* - by Dharampal
10. *Hind Swaraj or Indian Home Rule* - by Mohandas K. Gandhi
11. *India Wins Freedom* - Maulana Abdul Kalam Azad
12. *Vivekananda* - Romain Rolland (English)
13. *Gandhi* - Romain Rolland (English)

E-resources:

- <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf>
- <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf>
- <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf>
- <https://fdp-si.aicte-india.org/UHV%20I%20Teaching%20Material/D3-S2%20Respect%20July%202023.pdf>
- <https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf>
- <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>
- <https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
- <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

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity.	L1, L2
CO2	Identify one's self, and one's surroundings (family, society nature).	L1, L2
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life	L3
CO4	Relate human values with human relationship and human society.	L4
CO5	Justify the need for universal human values and harmonious existence	L5
CO6	Develop as socially and ecologically responsible engineers	L3, L6



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B.Tech. II Year I Semester

SURVEYING

II-I sem

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0103T	3 : 0 : 0:0	3	CIE: 30 SEE:70	3 Hours	ES

Course Objectives:

The objective of this course is to:

1. Know the principle and methods of surveying and measuring of horizontal and vertical- distances and angles.
2. Identification of source of errors and rectification methods.
3. Know surveying principles to determine areas and volumes.
4. Setting out curves and use modern surveying equipment's for accurate results.
5. Know the basics of Photogrammetry Surveying.

SYLLABUS

Total Hours:48

Unit- I

10 Hrs

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 –systems and W.C.B and Q.B systems of locating bearings.

Unit- II

10 Hrs

Leveling- Types of levels, methods of levelling, and Determination of levels, Effect of Curvature 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

8 Hrs

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

10 Hrs

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves. Introduction to Tacheometric 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

10 Hrs

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.



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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 Venkat Ramaiah , Universities Press 1st Edition, 2011.

Reference Books:

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.

E-resources:

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

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Apply the principle and methods of surveying and measuring of horizontal and vertical- distances and angles	L2
CO2	Identify the source of errors and rectification methods	L3
CO3	Apply surveying principles to determine areas and volumes	L2
CO4	Setting out curves and using modern surveying equipment's	L3
CO5	Apply the basics of Photogrammetry Surveying in field	L4

CO – PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	1	-	1	-	1	2	1	1	2	3	-
CO2	3	1	-	1	-	1	-	1	2	1	1	2	3	-
CO3	3	1	-	1	-	1	-	1	2	1	1	2	3	-
CO4	3	1	-	1	-	1	-	1	2	1	1	2	3	-
CO5	3	1	-	1	-	1	-	1	2	1	1	2	3	-



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B.Tech. II Year I Semester

STRENGTH OF MATERIALS

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0104T	3 : 0 : 0:0	3	CIE: 30 EE:70	3 Hours	PC

Course Objectives:

The objective of this course is:

1. To impart Fundamental concepts of Strength of Material and Principles of Elasticity and Plasticity Stress.
2. To impart concepts of shear force and bending moment on various types of beams and loading conditions.
3. To impart concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.
4. To the concepts above will be utilized in measuring deflections in beams under various loading and support conditions.
5. To classify cylinders and columns based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

SYLLABUS

Total Hours:48

Unit- I

8 Hrs

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

10 Hrs

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

10 Hrs

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

10 Hrs

Double integration and Moment area methods — Determination of slope and deflection 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. Mohr's theorems — Moment area method — application to simple cases of cantilever.

Unit- V

10 Hrs

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



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formula – Prof. Perry's formula.

Thin and Thick cylindrical shells — Derivation of formula for longitudinal and circumferential stresses — hoop, longitudinal and volumetric strains — changes in diameter, and volume of thin cylinders. Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses.

Textbooks:

1. Strength of Materials by R. K. Bansal, Lakshmi Publications, 16th Edition, 2022.
2. Strength of Materials by B. S. Basavarajaiah and P. Mahadevappa, Universities Press 3rd Edition, 2010.
3. Strength of Materials by J.K. Gupta and S.K. Gupta, Cengage publications 2nd edition ,2024.

Reference Books:

1. Advanced Mechanics of Solids, L.S Srinath, McGraw Hill Education, 2017, 3rd Edition
2. Strength of Materials - Fundamentals and Applications, T.D.Gunneswara Rao and Mudimby Andal, Cambridge University Press, 2018, 1st Edition
3. Mechanics of Materials, Beer and Johnston, McGraw Hill India Pvt. Ltd., 2020, 8th Edition (SI Units).
4. Mechanics of Solids — E P Popov, Prentice Hall, 2nd Edition, 2015.
5. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, NewDelhi 7th edition 2022.
6. Strength of Materials by S.S.Ratan Tata McGrill Publications 3rd Edition , 2016.

E-resources:

<https://nptel.ac.in/courses/105/105/105105108/>

Course Outcomes:

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

COs	Statements	Blooms level
CO1	To understand the basic materials behavior under the influence of different external loading conditions and the support conditions.	L2
CO2	To draw the diagrams indicating the variation of the key performance features like axial forces, bending moment and shear forces in structural members.	L3
CO3	To acquire knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams	L2
CO4	To Analyse the deflections due to various loading conditions.	L3
CO5	To assess stresses across section of the thin, thick cylinders and columns to arrive at optimum sections to withstand the internal pressure using Lamé's equation	L4

CO – PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	-	-	-	-	-	2	1	3	3	1
CO2	2	1	-	1	-	-	-	-	-	1	1	2	3	1
CO3	2	2	-	1	-	-	-	-	-	2	1	2	3	2
CO4	1	2	-	1	-	-	-	-	-	2	1	1	3	2
CO5	2	1	-	2	-	-	-	-	-	1	1	2	3	2



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B.Tech. II Year I Semester

FLUID MECHANICS

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0105T	3 : 0 : 0:0	3	CIE: 30 SEE:70	3 Hours	PC

Course Objectives:

- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To impart ability to solve engineering problems in fluid mechanics
- To enable the students measure quantities of fluid flowing in pipes, tanks and channels
- To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
- To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

SYLLABUS

Total Hours:48

Unit- I

10 Hrs

Introduction: 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

10 Hrs

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, inclined surfaces, Buoyancy and stability of floating bodies.

Unit- III

10 Hrs

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

10 Hrs

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

8 Hrs

Flow through Orifices and Mouth Piece: Classification of orifice and Mouth piece, Classification of Notches and Weirs

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:



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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:

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

E-resources:

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

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Understand the principles of fluid statics, kinematics and dynamics	L2
CO2	Apply the laws of fluid statics and concepts of buoyancy	L3
CO3	Understand the fundamentals of fluid kinematics and differentiate types of fluid flows	L2
CO4	Apply the Principle of conservation of energy for flow measurement.	L3
CO5	Analyse the losses in pipes and discharge through pipe network.	L4

CO – PO Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	2	-	-	1	-	1	1	3	1
CO2	3	3	-	-	-	2	-	-	3	-	3	3	3	1
CO3	3	1	-	-	-	3	-	-	1	-	1	1	3	2
CO4	3	2	-	-	-	1	-	-	2	-	2	2	3	2
CO5	3	3	-	-	-	2	-	-	3	-	3	3	3	2



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B.Tech. II Year I Semester

SURVEYING LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0106P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives: By the end of This course will enable students to:

1. Know about various linear and angular measuring instruments.
2. Take Measurements in the linear and angular view.
3. Determine the area and volume by interpreting the data obtained from surveying activities.
4. Know modern equipment such as total station.
5. Draft field notes from survey data.

Syllabus

Total Hours:45

Note: Students have to perform any 10 of the following Experiments

List of Field Works:

1. Chain survey of road profile with offsets in case of road widening.
2. Determination of distance between two inaccessible points by using compass.
3. Plane table survey; finding the area of a given boundary by the method of Radiation.
4. Fly levelling: Height of the instrument method (differential leveling).
5. Fly levelling: rise and fall method.
6. Theodolite survey: determining the horizontal and vertical angles by the method of repetition method.
7. Theodolite survey: finding the distance between two in accessible points.
8. Theodolite survey: finding the height of far object.
9. Determination of area perimeter using total station.
10. Determination of distance between two inaccessible point by using total station.
11. Setting out a curve.
12. Determining the levels of contours.

Reference Book(s):

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.

E-Resources

<https://sl-iitr.vlabs.ac.in/Introduction.html>
<https://nptel.ac.in/courses/105/104/105104101/>



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Course Outcomes:

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

COs	Statements	Blooms level
CO1	Handle various linear and angular measuring instruments	L3
CO2	Measure the linear and angular measurements	L1
CO3	Calculate the area and volume by interpreting the data obtained from surveying activities	L4
CO4	Handle modern equipment such as total station	L3
CO5	Prepare field notes from survey data	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	-	2	1	-	-	-	3	2	2	2	2	-
CO 2	2	2	-	2	1	-	-	-	3	3	3	2	2	-
CO 3	2	2	-	2	1	-	-	-	3	2	2	2	2	-
CO 4	1	2			3				3	2	2	1	1	
CO5	2	1			-				3	2	2	1	1	



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B.Tech. II Year I Semester

STRENGTH OF MATERIALS LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0107P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives:

By the end of this course student will be able to

1. To determine the tensile strength and yield parameters of mild steel
2. To find out flexural strengths of Steel/Wood specimens and measure deflections
3. To determine the torsion parameters of mild steel bar
4. To determine the hardness numbers, impact and shear strengths of metals
5. To determine the load-deflection parameters for springs

Syllabus

TotalHours:45

Note: Students have to perform any 10 of the following Experiments

List of Experiments:

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

Reference Book(s):

1. Strength of Materials by R. K. Bansal, Lakshmi Publications, 16th Edition, 2022.
2. Strength of Materials by B. S. Basavarajaiah and P. Mahadevappa, Universities Press 3rd Edition, 2010.
3. Strength of Materials by J.K. Gupta and S.K. Gupta, Cengage publications 2nd edition ,2024.

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Conduct tensile strength test and draw stress-strain diagrams for ductile metals	L3,L4
CO2	Perform bending test and determine load-deflection curve of steel/wood	L3
CO3	Able to conduct torsion test and determine torsion parameters	L3
CO4	Perform hardness, impact and shear strength tests and calculate hardness numbers, impact and shear strengths	L4
CO5	Able to conduct tests on closely coiled and open coiled springs and calculate deflections	L3



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CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	-	-	1	1	-	-	-	2	1	-	1	3	-
CO 2	3	1	1	-	2	-	-	-	-	1	-	1	2	1
CO 3	3	-	-	1	1	-	-	-	2	1	-	1	3	-
CO 4	3	1	1	-	2	-	-	-	-	1	-	1	2	1
CO5	3	-	-	1	1	-	-	-	2	1	-	1	3	-



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B.Tech. II Year I Semester

BUILDING PLANNING AND DRAWING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0108P	0:1:2:0	2	CIE:30 SEE:70	3Hours	SEC

Course Objectives:

By the end of this course student will be able to

1. Initiating the student to different building bye-laws and regulations.
2. Imparting the planning aspects of residential buildings and public buildings.
 3. Giving training exercises on various signs and bonds.
 4. Giving training exercises on different building units.
5. Imparting the skills and methods of planning of various buildings.

Syllabus

TotalHours:45

Note: Students have to perform any 10 of the following Experiments

List of Experiments :

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

Text Books:

1. Planning, designing and Scheduling, Gurcharan Singh and Jagdish Singh
2. Building planning and drawing by M. Chakraborti.
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
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, McGrawHill Education (P)India Ltd. New Delhi.

E-Resources

1. <https://www.youtube.com/watch?v=M-5Oeby5-BI>
2. <https://nptel.ac.in/courses/124107157>
3. <https://nptel.ac.in/courses/112103019>



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Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Plan various buildings as per the building by-laws.	L3
CO2	Distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.	L4
CO3	Draw signs and bonds	L3
CO4	Draw different building units	L3
CO5	Learn the skills of drawing building elements and plan the buildings as per requirements.	L4

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	-	-	3	3	2	-	2	2	2	3	-
CO2	1	1	2	-	-	3	2	-	-	2	1	1	-	-
CO3	1	1	2	-	-	3	3	2	-	2	2	2	3	1
CO4	1	1	2	-	-	3	3	2	-	2	2	2	3	1
CO5	1	1	2	-	-	3	3	2	-	2	2	2	3	1



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B.Tech. II Year I Semester

ENVIRONMENTAL SCIENCE

Course Code	L : T : P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0109T	2 : 0 : 0:0	-	CIE: 30	3 Hours	Audit course

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

SYLLABUS

Total Hours:30

Unit- I	MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES	6 Hrs
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Definition, Scope and Importance – Need for Public Awareness.; **Natural Resources** : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Unit- II	ECOSYSTEMS	6 Hrs
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Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- Forest ecosystem.
- Grassland ecosystem
- Desert ecosystem.
- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit- III	ENVIRONMENTAL POLLUTION	6 Hrs
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Definition, Cause, effects and control measures of :

- Air Pollution.
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

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

Unit- IV	SOCIAL ISSUES AND THE ENVIRONMENT	6 Hrs
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From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Unit- V	HUMAN POPULATION AND THE ENVIRONMENT	6 Hrs
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Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

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

Textbooks:

1. 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.

Reference Books:

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.

E-resources:

<https://archive.nptel.ac.in/courses/120/108/120108004/>

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B.Tech. II Year II Semester

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	HM	23A0022T	Managerial Economics and Financial Analysis	2	0	0	2
2	ES	23A0110T	Engineering Geology	3	0	0	3
3	PC	23A0111T	Concrete Technology	3	0	0	3
4	PC	23A0112T	Structural Analysis	3	0	0	3
5	PC	23A0113T	Hydraulics &Hydraulic Machinery	3	0	0	3
6	PC	23A0114P	Concrete Technology Lab	0	0	3	1.5
7	PC	23A0115P	Engineering Geology lab	0	0	3	1.5
8	SEC	23A0026P	Soft Skills	0	1	2	2
9	ES	23A0413T	Design Thinking & Innovation	1	0	2	2
Total Credits							21

Mandatory Community Service Project Internship of 08 weeks duration during summer vacation(23A0145P)

Category	CREDITS
Management Elective-I (HM)	2
Engineering Science Courses (ES)	5
Professional Core Course (PC)	12
Skill Enhancement Course (SEC)	2
TOTALCREDITS	21

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B.Tech. II Year II Semester

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0022T	2:0:0:0	2	CIE:30 SEE:70	3 Hours	HM-1
Course Objectives:					
<ul style="list-style-type: none"> To inculcate the basic knowledge of microeconomics and financial accounting To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost To Know the Various types of market structure and pricing methods and strategy To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions. To provide fundamental skills on accounting and to explain the process of preparing financial statements. 					
Syllabus				Total Hours: 45	
Unit-I	Managerial Economics			9Hrs	
Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.					
Unit-II	Production and Cost Analysis			9Hrs	
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break- Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).					
Unit-III	Business Organizations and Markets			9Hrs	
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			9Hrs	
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, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems).					
Unit-V	Financial Accounting and Analysis			9Hrs	
Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance-Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to 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.



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Reference Books:

1. Ahuja HI 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>

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Define the concepts related to Managerial Economics, financial accounting and management.	L2
CO2	Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets.	L2
CO3	Apply the Concept of Production cost and revenues for effective Business decision.	L3
CO4	Analyse how to invest their capital and maximize returns.	L4
CO5	Evaluate the capital budgeting techniques.	L5
CO6	Develop the accounting statements and evaluate the financial performance of business entity.	L5



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B.Tech. II Year II Semester

Engineering Geology					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0110T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	ES
The objective of this course is:					
<ul style="list-style-type: none"> To know the importance of Engineering Geology to the Civil Engineering. To enable the students, understand what minerals and rocks are and their formation and identification. To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures. To enable the student realize its importance and applications of Engineering Geology in Civil Engineering constructions. concepts of Groundwater and its geophysical methods. 					
Syllabus					Total Hours:
					48
Unit-I					8Hrs
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					10Hrs
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					10Hrs
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					10Hrs
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 belts, 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					10Hrs



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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. Engineering Geology by N. Chenna Kesavulu, Laxmi Publications . 2ndEdn 2014.
2. Engineering & General Geology by Parbin Singh Katson educational series 8th 2023.

Reference Books:

1. Engineering Geology by Subinoy Gangopadhyay Oxford University press 1st edition, 2012.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing, 2ndEdn , 2017,
3. Geology for Engineers and Environmental Society' Alan E Kehew, 3rd edn., 2013) Pearson publications.
4. Environmental Geology' (2013) K.S.Valdiya, 2nd ed., McGraw Hill Publications.

Online Learning Resources:

1. <http://nptel.iitm.ac.in/video.php?subjectId=105105106>
2. <http://nptel.iitm.ac.in/video.php?courseId=1055&p=1>
3. <http://nptel.iitm.ac.in/video.php?courseId=1055&p=3>
4. <http://nptel.iitm.ac.in/video.php?courseId=1055&p=4>

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Understand the significance of geological agents on Earth surface and its significance in Civil Engineering	L2
CO2	Identify and understand the properties of Minerals and Rocks.	L2
CO3	Understand the concepts of Groundwater and its geophysical methods.	L2
CO4	Classify and measure the Earthquake prone areas, Landslides and subsidence to practice the hazard zonation.	L2
CO5	Investigate the project site for mega/mini civil engineering projects and site selection for mega engineering projects like Dams, Reservoirs and Tunnels.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	1	2	2
CO2	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	1	1
CO4	3	3	3	2	3	-	2	-	-	-	2	2	2	1
CO5	3	3	2	2	3	-	2	-	-	-	2	2	2	1



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B.Tech. II Year II Semester

CONCRETE TECHNOLOGY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0111T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

The objective of this course is:

Upon successful completion of this course, the student will be able to

1. Learn materials and their properties used in the production of concrete.
2. Learn the behavior of concrete at fresh stage.
3. Learn the behavior of concrete at hardened stage.
4. Learn the influence of elasticity, creep and shrinkage on concrete.
5. Learn the mix design methodology and special concretes.

Syllabus	Total Hours: 48
Unit-I	10Hrs

Cements: Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entertainers, 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 – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Maximum aggregate size- Quality of mixing water.

Unit-II	10Hrs
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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	10Hrs
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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	8Hrs
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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	10Hrs
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B.Tech. II Year II Semester

STRUCTURAL ANALYSIS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0112T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

The objective of this course is:

Upon successful completion of this course, the student will be able to

1. Learn energy theorems.
2. Learn the analysis of indeterminate structures.
3. Analysis of fixed and continuous beams.
4. Learn about slope-deflection method.
5. Learn about Moment – distribution method.

Syllabus	Total Hours: 48
Unit-I	10Hrs

Energy theorems : Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano's first theorem Deflections of simple beams and pin jointed trusses.

Unit-II	10Hrs
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

Unit-III	10Hrs
Fixed 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. Analysis of propped cantilevers.	

Unit-IV

Unit-IV	8Hrs
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

Unit-V	10Hrs
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.
4. Structural Analysis – D.S.Prakasarao -Univeristy press.
5. Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, New Delhi.



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Online Learning Resources:

<https://nptel.ac.in/courses/105/105/105105166/>

<https://nptel.ac.in/courses/105101085>

<https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ce35/>

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Apply energy theorems to Analyse trusses.	L3
CO2	Analyse indeterminate structures by using Castigliano's-II theorem.	L4
CO3	Analysis of fixed and continuous beams.	L4
CO4	Analyse continuous beams and portal frames by using slope-deflection method.	L4
CO5	Analyse continuous beams and portal frames by using Moment – distribution method.	L4

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	1	-	-	-	-	-	-	1	2	1
CO2	3	2	-	-	1	-	-	-	-	-	-	1	2	1
CO3	3	2	-	-	2	-	-	-	-	-	-	1	2	3
CO4	3	2	-	-	2	-	-	-	-	-	-	1	2	3
CO5	3	2	-	-	2	-	-	-	-	-	-	1	2	3



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B.Tech. II Year II Semester

HYDRAULICS AND HYRAULIC MACHINERY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0113T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

The objective of this course is:

Upon successful completion of this course, the student will be able to

1. To Introduce concepts of laminar and turbulent flows.
2. To teach principles of uniform flows through open channel.
3. To teach principles of non-uniform flows through open channel.
4. To impart knowledge on design of turbines.
5. To impart knowledge on design of pumps.

Syllabus	Total Hours: 48
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.	8Hrs
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	10Hrs
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.	10Hrs
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.	10Hrs
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.	10Hrs
Textbooks: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024. 	



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2. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
4. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty 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/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand the characteristics of laminar and turbulent flows.	L2
CO2	Apply the knowledge of fluid mechanics to address the uniform flow problems in open channels.	L3
CO3	Solve non-uniform flow problems and hydraulic jump phenomenon in open channel flows.	L3
CO4	Evaluate the performance of impact of jets on plates and design Pelton wheel, Francis and Kaplan turbine.	L5
CO5	Understand the principles, losses and its efficiencies of centrifugal pumps.	L2

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	2	-	-	-	-	2	-	3	1
CO2	3	3	-	-	-	3	-	-	-	-	3	-	3	1
CO3	3	3	-	-	-	3	-	-	-	-	3	-	3	1
CO4	3	3	-	-	-	3	-	-	-	-	3	-	3	2
CO5	3	2	-	-	-	2	-	-	-	-	2	-	3	2



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B.Tech. II Year II Semester

CONCRETE TECHNOLOGY LABORATORY

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0114P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives:

Upon successful completion of this course, the student will be able to

- To test basic properties of ingredients of concrete fresh and hardened concrete properties

Syllabus

TotalHours:48

List Of Experiments :

1. Tests on Cement

- 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

- 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

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

4. Tests on fresh Concrete

- 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

- 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)

6. Self-Compacting Concrete

- L-Box, V Funnel

Text Books:

- Properties of Concrete by A.M. Neville – PEARSON – 4th edition
- Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5th edition 2013.
- Concrete Technology by Job Thomas, Cengage Publications, 1st edition, 2015



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Reference Books:

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGraw Hill 4th edition 2014
2. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
3. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi

E-Resources

<https://nptel.ac.in/courses/105/104/105104030/>
<https://nptel.ac.in/courses/105/102/105102012/>

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Outline importance of testing cement and its properties.	L1
CO2	Assess different properties of Aggregates	L5
CO3	Assess fresh concrete properties and their relevance to hardened concrete.	L5
CO4	Assess hardened concrete properties.	L5

CO – PO Articulation Matrix:

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



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B.Tech. II Year II Semester

Engineering Geology Laboratory

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0115P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives:

The objective of this course is:

- To identify the Megascopic types of Ore minerals & Rock forming minerals.
- To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection.

Syllabus

TotalHours:48

List Of Experiments :

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

LAB EXAMINATION PATTERN:

- Description and identification of FOUR minerals
- Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
- ONE Question on Interpretation of a Geological map along with a geological section.
- TWO Questions on Simple strike and Dip problems.
- Bore hole problems.
- Project report on geology.

Reference Books:

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

E-Resources

<https://nptel.ac.in/courses/105105106>



GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

(AUTONOMOUS)

Accredited by NAAC with 'A' Grade, Accredited by NBA (B.Tech.,-ECE, EEE & Mech : 2024-2027
(Approved by AICTE & and UGC, New Delhi & Affiliated to JNTUA, Anantapur.)
3rd Mile, Nellore - Bombay Highway, Gangavaram (V), Kovur (M), S.P.S.R. Nellore Dt, Andhra Pradesh - India. 524 137
website: gist.edu.in / e-mail: geethanjali@gist.edu.in.



B.Tech. II Year II Semester

SOFT SKILLS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0026P	0:1:2:0	2	CIE:30 SEE:70	3 Hours	SEC

The objective of this course is:

To encourage all round development of the students by focusing on soft skills

1. To make the students aware of critical thinking and problem-solving skills
2. To enhance healthy relationship and understanding within and outside an organization
3. To function effectively with heterogeneous teams .

Syllabus	Total Hours: 45
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	8Hrs
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Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open mindedness – Creative Thinking - Positive think

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	8Hrs
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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	10Hrs
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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	9 Hrs
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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

NOTE:-

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Le

Textbooks:

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 .

Online Learning Resources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KIJ



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B.Tech. II Year II Semester

DESIGN THINKING & INNOVATION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0413T	1:0:2:0	2	CIE:30 SEE:70	3 Hours	ES

The objective of this course is:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Syllabus	Total Hours: 45
Unit-I Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.	8Hrs
Unit-II Design thinking process (empathize, Analyse, 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.	9Hrs
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.	10Hrs
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.	10Hrs
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.	8Hrs

Textbooks:

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- Kritinaholden, 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/>



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B.Tech. II Year II Semester

COMMUNITY SERVICE PROJECT

Experiential learning through community engagement

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0145P	0:0:0:3	1.5	SEE:100	-	PR

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.



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- 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 Electricit
 - 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



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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

1. Marine products
2. Aqua culture
3. Inland fisheries
4. Animals and species
5. Nutrition
6. Traditional health care methods
 7. Food habits
 8. Air pollution
 9. Water pollution
 10. Plantation
 11. Soil protection
12. Renewable energy
13. Plant diseases
14. Yoga awareness and practice
15. Health care awareness programmes and their impact
16. Use of chemicals on fruits and vegetables
17. Organic farming
18. Crop rotation



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19. Floury culture
20. Access to safe drinking water
21. Geographical survey
22. Geological survey
23. Sericulture
24. Study of species
25. Food adulteration
26. Incidence of Diabetes and other chronic diseases
27. Human genetics
28. Blood groups and blood levels
29. Internet Usage in Villages
30. Android Phone usage by different people
31. Utilisation of free electricity to farmers and related issues
32. 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



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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 secretariats 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 programmes to be conducted, spread over two weeks of time. The list of



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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.

Member Secretary

Head of the Department,
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CE-HOD



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B.Tech. III Year I Semester

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1.	PC	23A0116T	Water Resources Engineering	3	0	0	3
2.	PC	23A0117T	Design of Reinforced Concrete Structures	3	0	0	3
3.	PC	23A0118T	Geotechnical Engineering	3	0	0	3
4.	PE		Professional Elective-I	3	0	0	3
5.	OE		Open Elective-I	3	0	0	3
6.	MC	23A0522T	Introduction to Quantum Technology and Applications	3	0	0	3
7.	PC	23A0122P	Geotechnical Engineering Lab	0	0	3	1.5
8.	PC	23A0123P	Fluid Mechanics Hydraulic Machines Lab	0	0	3	1.5
9.	SEC	23A0124P	Estimation, Specifications, Costing & Valuation	0	1	2	2
10.	ES	23A0420P	Tinkering Lab	0	0	2	1
11.	PR	23A0145P	Evaluation of Community Service Internship	-	-	-	2
Total				18	01	10	26

S. No.	Course Code	Name of the Professional Elective
1	23A0119T	Pre-stressed Concrete
2	23A0120T	Air Pollution and Control
3	23A0121T	Environmental Impact Assessment

S. No.	Course Code	Name of the Open Elective	Offered by the Dept.
1.	23A0442T	Electronic Circuits	ECE
2.	23A0222T	Electrical Safety Practices and Standards	EEE
3.	23A0319T	Sustainable Energy Technologies	MECH
4.	23A0545T	Java Programming	CSE & Allied/IT
5.	23A0546T	Fundamentals of Artificial Intelligence	
6.	23A0547T	Quantum Technology & Applications	
7.	23A0027T	Mathematics for Machine Learning and AI	Mathematics
8.	23A0034T	Materials Characterization Techniques	Physics
9.	23A0040T	Chemistry of Energy Systems	Chemistry
10.	23A0044T	English for Competitive Examinations	Humanities
11.	23A0051T	Entrepreneurship and New Venture Creation	



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Note:

4. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
5. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
6. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

Category	CREDITS
Professional Core Course (PC)	12
Professional Elective Course (PE)	3
Open Elective Course (OE)	3
Skill oriented Course (SEC)	2
Mandatory Course (MC)	3
Community Service Project (PR)	2
Engineering Science Course (ES)	1
TOTALCREDITS	26

Member Secretary

Head of the Department,
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CE-HOD



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B.Tech. III Year I Semester

WATER RESOURCES ENGINEERING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0116T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental concepts of hydrology, including precipitation, evaporation, infiltration, and runoff, and their significance in water resource management.
2. Analyse hydrographs, unit hydrographs, and groundwater characteristics for estimating water availability and flood management.
3. Evaluate the necessity, importance, and methods of irrigation, along with soil-water-plant relationships and irrigation efficiencies.
4. Apply silt theories and principles of canal design to ensure efficient water conveyance and management in irrigation systems.
5. Assess the principles of diversion head works, water logging, canal lining, and the stability of hydraulic structures on permeable foundations.

Syllabus	Total Hours: 48
Unit-I Introduction to hydrology Engineering Hydrology and Its Applications; Hydrologic Cycle; Precipitation- Types and forms, Rainfall Measurement, Types of Rain Gauges, Computation of Average Rainfall Over A Basin, Presentation and Interpretation of Rainfall Data. Evaporation- Factors Affecting Evaporation, Measurement of Evaporation; Infiltration- Factors Affecting Infiltration, Measurement of Infiltration, Infiltration Indices; Run off- Factors Affecting Run- off, Computation of Run-Off; Design Flood; Estimation of Maximum Rate of Run-Off; Separation of Base Flow.	8Hrs
Unit-II Hydrograph Analysis Hydrograph; Unit Hydrograph- Construction and Limitations of Unit Hydrograph, Application of The Unit Hydrograph to The Construction of a Flood Hydrograph Resulting From Rainfall of Unit Duration; S-Hydrograph. GROUND WATER: Introduction; Aquifer; Aquiclude; Aquifuge; Aquifer Parameters Porosity, Specific Yield, Specific Retention; Divisions of Sub-Surface Water; Water Table; Types of Aquifers; Storage Coefficient-Coefficient of Permeability and Transmissibility	10Hrs
Unit-III Introduction to Irrigation Introduction; Necessity and Importance of Irrigation; Advantages and Ill Effects of Irrigation; Types of Irrigation; Methods of Application of Irrigation Water; Quality for Irrigation Water. Duty and Delta; Duty At Various Places; Relation Between Duty and Delta; Factors Affecting Duty; Methods of Improving Duty. WATER REQUIREMENT of CROPS: Types of Soils, Indian Agricultural Soils, Preparation of Land for Irrigation; Soil Fertility; Soil-Water-Plant Relationship; Vertical Distribution of Soil Moisture; Soil Moisture Tension; Soil Moisture Stress; Various Soil Moisture Constants; Limiting Soil Moisture Conditions; Depth and Frequency of Irrigation; Gross Command Area; Culturable Command Area; Culturable Cultivated and Uncultivated Area; Kor Depth and Kor Period; Crop Seasons and Crop Rotation; Irrigation Efficiencies; Determination of Irrigation Requirements of Crops; Assessment of Irrigation Water.	10Hrs



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Consumptive Use of Water-Factors Affecting Consumptive Use, Direct Measurement and Determination By Use of Equations (Theory Only)

Unit-IV	Channels – Silt Theories	10Hrs
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Classification; Canal Alignment; Inundation Canals; Cross-Section of An Irrigation Channel; Balancing Depth; Borrow Pit; Spoil Bank; Land Width; Silt Theories– Kennedy's Theory, Kennedy's Method of Channel Design; Drawbacks in Kennedy's Theory; Lacey's Regime Theory- Lacey's Theory Applied to Channel Design; Defects in Lacey's Theory; Comparison of Kennedy's and Lacey's Theory.

WATER LOGGING and CANAL LINING: Water Logging; Effects of Water Logging; Causes of Water Logging; Remedial Measures; Saline and Alkaline Soils and their Reclamation; Losses in Canal; Lining of Irrigation Channels – Necessity, Advantages and Disadvantages; Types of Lining; Design of Lined Canal.

Unit-V	Diversion Head Works	10Hrs
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Types of Diversion Head Works; Diversion and Storage Head Works; Weirs and Barrages; Layouts of Diversion Head Works; Components; Causes and Failure of Hydraulic Structures On Permeable Foundations; Bligh's Creep Theory; Khosla's Theory; Determination of Uplift Pressure, Impervious Floors Using Bligh's and Khosla's Theory; Exit Gradient.

Textbooks:

1. Irrigation and Water Power Engineering by Punmia & Lal, Laxmi Publications Pvt. Ltd., New Delhi 17th Edition 2021
2. Engineering Hydrology by K. Subramanya, The Tata McGraw Hill Company, Delhi 5th Edition 2020

Reference Books:

1. Irrigation Engineering and Hydraulic Structures By S. K. Garg; Khanna Publishers, Delhi 36th Edition
2. Engineering Hydrology By Jayarami Reddy, Laxmi Publications Pvt. Ltd., New Delhi 3rd Edition 2016
3. Irrigation and Water Resources & Water Power By P.N.Modi, Standard Book House 6th Edition 2020

Online Learning Resources:

<https://nptel.ac.in/courses/105101214>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the hydrologic cycle, precipitation types, and measurement techniques for rainfall, evaporation, infiltration, and runoff computation.	L2
CO2	Analyse hydrographs, unit hydrographs, and groundwater flow parameters for flood estimation and water resource planning.	L4
CO3	Evaluate irrigation requirements, soil-water-plant relationships, duty, delta, and irrigation efficiencies for sustainable agricultural productivity.	L5
CO4	Apply silt theories and design principles of irrigation canals to ensure effective water conveyance and prevent water logging.	L3
CO5	Assess the stability of diversion head works, including weirs and barrages, using Bligh's and Khosla's theories for hydraulic structure design.	L5



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CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	-	2	-	2	2	2
CO2	3	3	3	3	3	-	-	-	-	2	-	2	3	2
CO3	3	3	3	3	2	-	-	-	-	2	-	2	3	3
CO4	3	3	3	3	3	3	3	3	-	2	-	2	3	3
CO5	3	3	3	3	3	2	2	2	-	2	-	2	3	3



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B.Tech. III Year I Semester

DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0117T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental methods of concrete structure design, including elastic, ultimate load, and limit state methods.
2. Analyse and design reinforced concrete beams, slabs, staircases, columns, and footings using the Limit State Method as per IS codes.
3. Evaluate the behavior of reinforced concrete members in terms of flexure, shear, torsion, bond, and anchorage.
4. Apply design principles to ensure serviceability and safety of concrete structures under various loading conditions.
5. Develop skills to use design aids and professional software for the analysis and design of RC structures.

Syllabus	Total Hours: 48
Unit-I Methods of design of Concrete Structures Concept of Elastic Method, Ultimate Load Method and Limit State Method – Working Stress Method As Detailed in IS Code - Design of Singly Reinforced Beam By Working Stress Method - Limit State Philosophy As Detailed in IS Code - Advantages of Limit State Method Over Other Methods - Analysis and Design of Singly and Doubly Reinforced Rectangular Beams By Limit State Method.	10Hrs
Unit-II Limit State Method - Flanged Beam, Shear & Torsion Analysis and Design of Flanged Beams – Use of Design Aids for Flexure - Behaviour of RC Members in Bond and Anchorage - Design Requirements As Per Current Code - Behaviour of RC Beams in Shear and torsion - Design of RC Members for Combined Bending, Shear and torsion – Serviceability (Aspects of Deflection, Cracking aspects).	10Hrs
Unit-III Limit State Design of Slabs Analysis and Design of Cantilever, One Way, Two Way and Continuous Slabs Subjected to Uniformly Distributed Load for Various Boundary Conditions- –Introduction to Flat Slab.	10Hrs
Unit-IV Limit State Design of Columns & Footing LIMIT STATE DESIGN of COLUMNS Types of Columns – Design of Short Rectangular and Circular Columns for Axial, Uniaxial and Biaxial Bending. LIMIT STATE DESIGN of FOOTING Design of Wall Footing – Design of Axially and Eccentrically Loaded Rectangular Pad and Sloped Footings – Design of Combined Rectangular Footing for Two Columns Only.	10Hrs
Unit-V Limit State design of Stair Case Types of Staircases – Design of Dog-Legged Staircase	8Hrs

Textbooks:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Limit State Design, Laxmi Publications Pvt. Ltd., New Delhi
2. P. C. Varghese, Limit State—Designed of Reinforced Concrete, Prentice Hall of India, New Delhi



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Reference Books:

1. N. Krishnaraju, —Structural Design and Drawing, Universities Press Pvt ltd, Hyderabad.4rdedition 2020.
2. N.C. Sinha and S.K. Roy,—Fundamentals of Reinforced Concrete, S. Chand Publishers
3. N.Subramanian, —Design of Reinforced Concrete Structures, Oxford University Press

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/105/105105105/>

Codes/Tables: IS 456-2000 / IS-456-2024 and relevant sheets (Pertaining to columns) of SP 16 Code books to be permitted into the examinations Hall. NOTE: Assignment on preparation of drawing sheets detailing various RC Elements All the designs to be taught in Limit State Method Following plates should be prepared by the students.

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Reinforcement particulars of columns and footings.
4. Detailing of One-way, Two way and continuous slabs

Exam Pattern: The end examination paper should consist of Part A and Part B. Part A consists of two questions in Design and Drawing out of which one question is to be answered. Part-B should consist of five questions on design out of which three are to be answered. Weightage for Part -A is 40% and Part-B is 60%.

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the different methods of concrete structure design and their advantages.	L2
CO2	Analyse and design singly and doubly reinforced beams, flanged beams, slabs, and staircases using the Limit State Method.	L4
CO3	Evaluate the behavior of RC members under shear, torsion, and combined loading conditions.	L5
CO4	Design short columns and footings considering axial and eccentric loading conditions.	L6
CO5	Utilize IS code provisions and design aids for efficient structural design.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	2	-	2	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
CO3	3	2	2	2	2	-	-	-	-	-	-	1	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO5	2	2	2	1	3	-	-	-	-	2	1	2	2	2



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B.Tech. III Year I Semester

GEOTECHNICAL ENGINEERING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0118T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the classification and compaction characteristics of different soil types and their engineering significance.
2. Analyse the concepts of effective stress, permeability, and seepage in soils and their impact on soil behavior.
3. Apply stress distribution theories and settlement computations to evaluate soil response under loads.
4. Evaluate shear strength properties of soil using various testing methods and their applications in geotechnical engineering.
5. Assess the stability of slopes using different analytical methods and suggest suitable slope protection measures.

Syllabus		Total Hours: 48
Unit-I	Soil Classification & Compaction	10Hrs
Formation of Soil - Soil Description – Particle – Size Shape and Colour – Composition of Gravel, Sand, Silt, Clay Particles – Particle Behavior – Soil Structure – Phase Relationship – Index Properties – Significance – BIS Classification System – Unified Classification System – Compaction of Soils – Theory, Laboratory and Field Tests – Field Compaction Methods – Factors Influencing Compaction of Soils.		
Unit-II	Effective Stress & Permeability	10Hrs
Soil - Water – Static Pressure in Water - Effective Stress Concepts in Soils – Capillary Phenomena-Permeability Interaction – Hydraulic Conductivity – Darcy's Law – Determination of Hydraulic Conductivity – Laboratory Determination (Constant Head and Falling Head Methods) and Field Measurement Pumping Out in Unconfined and Confined Aquifer – Factors Influencing Permeability of Soils – Seepage - Two Dimensional Flow – Laplace's Equation – Introduction to Flow Nets – Simple Problems. (Sheet Pile and Weir)..		
Unit-III	Stress Distribution & Settlement	10Hrs
Stress Distribution in Homogeneous and Isotropic Medium – Boussinesq Theory – (Point Load, Line Load and UDL) Use of New Marks Influence Chart –Components of Settlement — Immediate and Consolidation Settlement – Terzaghi's One Dimensional Consolidation Theory – Computation of Rate of Settlement. - \sqrt{T} and Log T Methods– E-Log P Relationship.		
Unit-IV	Shear Strength	8Hrs
Shear Strength of Cohesive and Cohesion Less Soils – Mohr-Coulomb Failure Theory – Measurement of Shear Strength - Direct Shear, Tri-axial Compression, UCC and Vane Shear Tests – Pore Pressure Parameters – Cyclic Mobility – Liquefaction.		
Unit-V	Slope Stability Analysis	10Hrs
Stability Analysis - Infinite Slopes and Finite Slopes – total Stress Analysis for Saturated Clay – Friction Circle Method – Use of Stability Number – Method of Slices – Fellenious and Bishop's Method - Slope		



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Protection Measures.

Textbooks:

1. Soil Mechanics and Foundation Engg by K.R.Arora, Standard Publishers and Distributors Delhi 7th edition 2009
2. Geotechnical Engineering by C. Venkataramiah, New Age International Pvt. Ltd, (2002).

Reference Books:

1. Soil Mechanics and Foundation by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt.Ltd., New Delhi 17th edition 2017
2. Geotechnical Engineering by Iqbal H. Khan, PHI Publishers, 4th edition.
3. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt. Ltd, New Delhi 3rd edition 2016.

Online Learning Resources:

<https://nptel.ac.in/courses/105101201>

<https://nptel.ac.in/courses/105105185>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Classify soils based on their physical and index properties as per BIS and Unified classification systems.	L4
CO2	Analyse soil permeability and seepage problems using Darcy's law and flow net concepts.	L4
CO3	Apply stress distribution theories and settlement analysis to predict soil behavior under loading.	L3
CO4	Evaluate shear strength of soils using experimental methods and interpret test results.	L5
CO5	Assess slope stability and recommend suitable protection measures.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	2	-	2	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
CO3	3	2	2	2	2	-	-	-	-	-	-	1	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO5	2	2	2	1	3	-	-	-	-	2	1	2	2	2



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B.Tech. III Year I Semester

PRESTRESSED CONCRETE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0119T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-I

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the principles, methods, and materials used in prestressed concrete.
2. Analyse various losses of prestress in both pre-tensioned and post-tensioned members.
3. Design prestressed concrete beams considering flexure and shear forces.
4. Evaluate deflections in prestressed concrete structures and their controlling factors.
5. Analyse the behavior of composite beams under different loading conditions.

Syllabus		Total Hours: 48
Unit-I	Introduction to Pre-stress	8Hrs
Principles of Pre-Stressing – Prestressing Systems - Pre-Tensioning and Post Tensioning- Advantages and Limitations of Pre-Stressed Concrete- Need for High Strength Materials. Methods of Pre-Stressing: Pre-Tensioning (Hoyer System) and Post-Tensioning Methods (Freyssinet System and Gifford- Udall System)		
Unit-II	Losses Of Pre-Stress	10Hrs
Loss of Pre-Stress in Pre-Tensioned and Post-Tensioned Members Due to Elastic Shortening, Shrinkage and Creep of Concrete, Relaxation of Stress in Steel, Anchorage Slip and Frictional Losses.		
Unit-III	Flexural And Shear	10Hrs
Analysis of Beams for Flexure and Shear - Beams Pre-Stressed With Straight, Concentric, Eccentric, Bent and Parabolic Tendons- Kern Line - Cable Profile - Design of PSC Beams (Rectangular and I Sections) Using IS 1343. Analysis and Design of Rectangular and I Beams for Shear. Introduction to Transmission Length and End Block (No Design and Analytical Problems).		
Unit-IV	Deflections	10Hrs
Control of Deflections- Factors Influencing Deflections - Short Term Deflections of Uncracked Beams- Prediction of Long Term Deflections.		
Unit-V	Composite Beams	10Hrs
Different Types- Propped and Un-Propped- Stress Distribution- Differential Shrinkage- Analysis of Composite Beams.		

Text Books:

1. Prestressed Concrete by N. Krishna Raju, Tata McGraw Hill Publications 6th edition 2018.
2. Prestressed concrete by N.Rajagopalan, Narosa Publishing House 2nd edition 2017

Reference Books:

1. Design of Prestressed Concrete Structures by T.Y. Lin & Ned H. Burns, John Wiley & Sons 3rd edition 2010
2. Prestressed Concrete Design by Praveen Nagrajan, Pearson publications, 2013.
3. Prestressed Concrete by Ramamrutham, Dhanpatrai Publications 2020 edition.
4. BIS code on —Prestressed concrete, IS: 1343-2012 to be permitted into the examination Hall.



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Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/106/105106118/>

<https://nptel.ac.in/courses/105106117>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the principles and methods of prestressing and the need for high-strength materials.	L2
CO2	Analyse the different types of prestress losses and their impact on structural performance.	L4
CO3	Design prestressed concrete beams considering flexural and shear stresses.	L6
CO4	Evaluate deflections in prestressed beams and suggest control measures.	L5
CO5	Analyse the stress distribution and differential shrinkage in composite beams.	L4

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	1	-	-	-	1	-	1	1	1
CO2	2	2	1	1	2	-	-	-	-	-	-	1	1	1
CO3	2	2	3	2	2	-	1	-	-	-	-	1	2	2
CO4	2	1	2	2	3	1	-	-	-	-	-	1	2	1
CO5	2	2	2	1	2	1	-	-	-	-	-	1	2	1



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B.Tech. III Year I Semester

AIR POLLUTION AND CONTROL

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0120T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-I

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the sources, classification, and effects of air pollution on humans and the environment.
2. Analyse meteorological factors influencing air pollution and dispersion modeling.
3. Design and evaluate control measures for particulate pollutants.
4. Apply techniques for controlling gaseous pollutants through chemical and physical processes.
5. Assess vehicular and indoor air pollution and propose control strategies.

Syllabus

Total Hours: 48

Unit-I

Introduction to Air Pollution

10Hrs

Definition - Sources & Classification of Air Pollutants - Effects of Air Pollution On Humans, Plants and Materials- Global Effects - Air Quality and NAAQS - National Clean Air Programme- Sampling of Pollutants in Ambient Air - Stack Sampling

Unit-II

Meteorology And Air Pollution

10Hrs

Factors Influencing Air Pollution, Wind Rose, Mixing Depths, Lapse Rates and Dispersion - Atmospheric Stability, Plume Rise and Dispersion, Prediction of Air Quality, Box Model - Gaussian Model - Dispersion Coefficient - Application of Tall Chimney for Pollutant Dispersion.

Unit-III

Control Of Particulate Pollutants

10Hrs

Properties of Particulate Pollution - Particle Size Distribution - Control Mechanism - Dust Removal Equipment - Design and Operation of Settling Chambers, Cyclones, Wet Dust Scrubbers, Fabric Filters & ESP.

Unit-IV

Control Of Gaseous Pollutants

8Hrs

Process and Equipment for The Removal By Chemical Methods - Design and Operation of Absorption and Adsorption Equipment - Combustion and Condensation Equipment.

Unit-V

Automobile And Indoor Pollution

10Hrs

Vehicular Pollution – Sources and Types of Emission – Effect of Operating Conditions-Alternate Fuels and Emissions-Emission Controls and Standards, Strategies to Control Automobile Pollution– Causes of Indoor Air Pollution-Changes in Indoor Air Quality-Control and Air Cleaning Systems-Indoor Air Quality

Text Books:

1. Rao, M. N. and Rao H. V. N., Air Pollution, Tata McGraw-Hill, New Delhi, 2007
2. Khare M, Sharma P, Kota, S.H, Sumanth C, Air Pollution Science Engineering and Management Fundamentals, CRC Press, 2024.
3. Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers, 1999.

Reference Books:

1. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H
2. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.



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3. Rao, C. S., Environmental Pollution Control Engineering, New Age International, New Delhi, 2006.
4. Mahajan S. P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
5. Peavy H. S., Rowe D. R. and Tchobanoglous G., Environmental Engineering, McGraw Hill, New York, 1985.

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/107/105107213/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the sources, classification, and global effects of air pollution.	L2
CO2	Analyse meteorological parameters affecting air pollution dispersion.	L4
CO3	Design control systems for particulate matter using appropriate removal techniques.	L6
CO4	Apply suitable technologies for gaseous pollutant removal through adsorption, absorption, and combustion.	L3
CO5	Evaluate vehicular and indoor air pollution sources and suggest mitigation strategies.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	2	3	-	-	1	-	1	1	1
CO2	2	2	-	2	2	3	3	-	-	-	-	1	2	2
CO3	2	2	3	2	2	3	3	-	-	-	-	1	2	2
CO4	2	1	2	2	3	3	3	-	-	-	-	1	2	2
CO5	2	2	2	2	2	3	3	2	-	-	-	1	2	2



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B.Tech. III Year I Semester

ENVIRONMENTAL IMPACT ASSESSMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0121T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-I

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
2. Analyse the impact of developmental activities on land use, soil, and water resources.
3. Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
4. Develop environmental audit procedures and assess compliance with environmental regulations.
5. Understand and apply environmental acts, notifications, and legal frame works in EIA studies.

Syllabus

Total Hours: 48

Unit-I

Concepts And Methodologies Of EIA

10Hrs

Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

Unit-II

Impact of Developmental Activities and Land Use

10Hrs

Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I A in Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts on Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

Unit-III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment

10Hrs

Introduction - Assessment of Impact of Development Activities On Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing Environmental Risk Assessment-Advantages of Environmental Risk Assessment.

Unit-IV

Environmental Audit

8Hrs

Introduction - Environmental Audit & Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report.

Unit-V

Environmental Acts and Notifications

10Hrs

The Environmental Protection Act, The Water Preservation Act, The Air (Prevention & Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000.



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Text Books:

- 1.Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996) Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers, 1999.

Reference Books:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi.
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi.

Online Learning Resources:

<https://archive.nptel.ac.in/courses/124/107/124107160/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Apply various methodologies for conducting Environmental Impact Assessments.	L3
CO2	Analyse the impact of land-use changes on soil, water, and air quality.	L4
CO3	Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.	L5
CO4	Develop environmental audit reports and assess compliance with environmental policies.	L6
CO5	Interpret and apply environmental acts and regulations related to EIA.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	3	-	-	-	-	-	1	2	2
CO2	3	3	3	2	2	3	-	-	-	-	-	1	3	2
CO3	3	3	3	2	2	3	3	-	-	-	-	1	3	3
CO4	3	3	3	3	2	3	3	-	-	-	-	1	3	3
CO5	2	2	2	2	2	3	3	3	-	-	-	1	2	2



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B.Tech. III Year I Semester

INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0544T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	MC

Course Objectives:

The objectives of this course are to make the student to:

1. Introduce fundamental quantum concepts like superposition and entanglement.
2. Understand theoretical structure of qubits and quantum information.
3. Explore conceptual challenges in building quantum computers.
4. Explain principles of quantum communication and computing.
5. Examine real-world applications and the future of quantum technologies.

Syllabus

Total Hours: 48

Unit-I	Introduction to Quantum Theory and Technologies	10Hrs
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The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China

Unit-II	Theoretical Structure of Quantum Information Systems	10Hrs
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What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view), Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

Unit-III	Building a Quantum Computer – Theoretical Challenges and Requirements	10Hrs
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What is required to build a quantum computer (conceptual overview)?, Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison), Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains exclusive, The role of quantum software in managing theoretical complexities

Unit-IV	Quantum Communication and Computing – Theoretical Perspective	8Hrs
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Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD), Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once), Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential



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Unit-V	Applications, Use Cases, and the Quantum Future	10Hrs
<p>Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race</p>		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Michael A. Nielsen, Isaac L. Chuang, <i>Quantum Computation and Quantum Information</i>, Cambridge University Press, 10th Anniversary Edition, 2010. 2. Eleanor Rieffel and Wolfgang Polak, <i>Quantum Computing: A Gentle Introduction</i>, MIT Press, 2011. 3. Chris Bernhardt, <i>Quantum Computing for Everyone</i>, MIT Press, 2019. 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. David McMahon, <i>Quantum Computing Explained</i>, Wiley, 2008. 2. Phillip Kaye, Raymond Laflamme, Michele Mosca, <i>An Introduction to Quantum Computing</i>, Oxford University Press, 2007. 3. Scott Aaronson, <i>Quantum Computing Since Democritus</i>, Cambridge University Press, 2013. 4. Alastair I.M. Rae, <i>Quantum Physics: A Beginner's Guide</i>, One world Publications, Revised Edition, 2005. 5. Eleanor G. Rieffel, Wolfgang H. Polak, <i>Quantum Computing: A Gentle Introduction</i>, MIT Press, 2011. 6. Leonard Susskind, Art Friedman, <i>Quantum Mechanics: The Theoretical Minimum</i>, Basic Books, 2014 		
<p>Online Learning Resources:</p> <p>IBM Quantum Experience and Qiskit Tutorials Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley edX – The Quantum Internet and Quantum Computers YouTube – Quantum Computing for the Determined by Michael Nielsen Qiskit Textbook – IBM Quantum</p>		

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain core quantum principles in a non-mathematical manner.	L2
CO2	Compare classical and quantum information systems.	L4
CO3	Identify theoretical issues in building quantum computers.	L1
CO4	Discuss quantum communication and computing concepts.	L2
CO5	Recognize applications, industry trends, and career paths in quantum technology.	L1



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B.Tech. III Year I Semester

GEOTECHNICAL ENGINEERING LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0122P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental index properties of soils and their significance in geotechnical engineering.
2. Perform field and laboratory tests to determine in-situ density and compaction characteristics of soils.
3. Evaluate the engineering properties of soil, including permeability, shear strength, and consolidation.
4. Analyse the strength and deformation characteristics of soils through shear and compression tests.
5. Interpret test results and relate engineering properties of soils to real-world geotechnical problems and design considerations.

Syllabus

TotalHours:48

List Of Experiments :

1. Determination of Index Properties
 - a. Specific Gravity of Soil
 - b. Grain Size Distribution – Sieve Analysis
 - c. Grain Size Distribution - Hydrometer Analysis
 - d. Liquid Limit and Plastic Limit Tests
 - e. Shrinkage Limit and Differential Free Swell Tests
2. Determination of In-Situ Density and Compaction Characteristics
 - a. Field Density Test (Sand Replacement Method)
 - b. Determination of Moisture–Density Relationship Using Standard Proctor Compaction Test.
3. Determination of Engineering Properties
 - a. Permeability Determination (Constant Head Method)
 - b. Permeability Determination (Falling Head Methods)
 - c. Determination of Co-Efficient of Consolidation
 - d. Direct Shear Test in Cohesion Less Soil
 - e. Unconfined Compression Test in Cohesive Soil
 - f. Laboratory Vane Shear Test in Cohesive Soil
 - g. Tri-Axial Compression Test in Cohesion Less Soil
 - h. California Bearing Ratio Test

Note: Any 10 of the above Experiments.



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Text Books:

1. Lambe T.W., —Soil Testing for Engineers, John Wiley and Sons, New York, 1951. Digitized 2008.
2. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.

Reference Books:

1. “Saibaba Reddy, E. Ramasastry, K. —Measurement of Engineering Properties of Soils”, New age International (P) limited publishers, New Delhi, 2008.
2. G.VenkatappaRao and Goutham .K. Potable, —Geosynthetics Testing – A laboratory Manual, Sai Master Geo environmental Services Pvt. Ltd., 1st Edition 2008.
3. Braja M.Das., —Soil Mechanics: Laboratory Manual, Oxford University Press, eighth edition, 2012

E-Resources

<https://nptel.ac.in/courses/105101160>

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Determine index properties of soil, including specific gravity, grain size distribution, and consistency limits.	L5
CO2	Conduct field and laboratory compaction tests to evaluate the moisture-density relationship of soil.	L2
CO3	Evaluate permeability and consolidation characteristics of soil using appropriate laboratory techniques.	L5
CO4	Analyse the shear strength and compressibility of soil through direct shear, unconfined compression, and tri-axial tests.	L4
CO5	Integrate test results and engineering judgment to interpret soil behavior and make informed decisions in geotechnical engineering applications.	L6

CO – PO Articulation Matrix:-

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	-	2	-	2	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
CO3	3	3	2	2	2	-	-	-	-	-	-	1	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO5	2	2	2	1	3	-	-	-	-	2	1	2	2	2



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B.Tech. III Year I Semester

FLUID MECHANICS HYDRAULIC MACHINES LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0123P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the principles of fluid mechanics and validate fundamental concepts through experiments.
2. Determine discharge coefficients for various flow measurement devices and Analyse flow behavior.
3. Evaluate energy losses in pipes, open channels, and hydraulic jumps to improve flow efficiency.
4. Analyse the impact of jet forces on vanes and their applications in hydraulic machinery.
5. Assess the performance characteristics of hydraulic turbines and pumps under different operating conditions.

Syllabus

TotalHours:48

List Of Experiments :

1. Verification of Bernoulli's Equation
2. Determination of Coefficient of Discharge for A Small Orifice By A Constant Head Method
3. Calibration of Venturimeter/ Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor Losses in Pipe Flow
6. Determination of Friction Factor of A Pipeline
7. Determination of Energy Loss in Hydraulic Jump
8. Determination of Manning's and Chezy's Constants for Open Channel Flow.
9. Impact of Jet On Vanes
10. Performance Characteristics of Pelton Wheel Turbine
11. Performance Characteristics of Francis Turbine
12. Performance Characteristics of Kaplan Turbine
13. Performance Characteristics of A Single Stage / Multistage Centrifugal Pump

Note: Any 10 of the above Experiments.

Text Books:

1. Desmukh T. S., A lab manual on Fluid Mechanics and Hydraulic Machines, Laxmi Publications
2. Dr. S.K. Panigrahi, Ms. L. Mohanty, Fluid Mechanics and Hydraulic Machines Laboratory Manual, S.K.KATARIA&SONS ,Educational Publisher.

Reference Books:

1. Dr. N. Kumara Swamy, Fluid Mechanics and Machinery Laboratory Manual, Chartor Publications
2. D. Sathish, Fluid Mechanics and Machinery Lab Manual, BP International Publications

E-Resources

<https://archive.nptel.ac.in/courses/112/106/112106311/>



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Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Verify Bernoulli's equation and apply it to real-life fluid flow problems.	L5
CO2	Determine the coefficient of discharge for orifices, notches, and flow meters.	L3
CO3	Evaluate head losses due to friction and minor losses in pipe flow systems.	L5
CO4	Analyse the impact of jets on vanes and its significance in hydraulic machinery.	L4
CO5	Assess the performance of turbines and pumps under different conditions and recommend optimal operating parameters.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	-	2	-	2	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
CO3	3	3	2	2	2	-	-	-	-	-	-	1	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO5	2	2	2	1	3	-	-	-	-	2	2	2	2	2



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B.Tech. III Year I Semester

ESTIMATION, SPECIFICATIONS, COSTING AND VALUATION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0124P	0:1:2:0	2	CIE:30 SEE:70	3Hours	SEC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the various methods and types of estimates used in civil engineering projects.
2. Develop detailed estimates for single and multi-storey buildings using standard estimation methods.
3. Analyse rate analysis, abstract estimation, and bill preparation as per standard procedures.
4. Prepare detailed specifications and tender documents for construction works.
5. Evaluate the valuation, cost escalation, and value analysis of buildings.

Syllabus

Total Hours:48

List of Experiments:

Introduction: Building bye Laws, Contracts-Types of Contracts, Tenders-Necessity and how to Quote the Tenders

1. Activity Based On Learning Methods and Types of Estimates
2. Preparation of Detailed Estimate for A Single-Storied Residential Building Using Wall to Wall Method
3. Preparation of Detailed Estimate for A Single Storied Residential Building Using Centre Line Method for Earthwork, Foundations, Super Structure, Fittings Including Sanitary and Electrical Fittings &Paintings.
4. Preparation of Detailed Estimate for A Two Storied Residential Building Using Centre Line Method for Earthwork, Foundations, Super Structure, Fittings Including Sanitary and Electrical Fittings &Paintings.
5. Activity Based Learning of Estimate Data and Rate Analysis
6. Preparation of Abstract Estimate for The Detailed Estimate in Exercise No.3
7. Preparation of Abstract Estimate for The Detailed Estimate in Exercise No.4
8. Writing of Measurement Book and Bill Preparation as Per AP State Govt Procedure for Detailed Estimate in No. 3 and Abstract Estimate of No. 6
9. Writing of Detailed Specifications for Various Items of Estimate and Preparing A Model Tender Document for The Work Listed in No. 3 and 6
10. Activity Based Learning for Valuation of Buildings, Cost Escalation Procedures and Value Analysis for Any One Work



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Text Books:

1. B.N. Dutta - Estimating and Costing in Civil Engineering, CBS Publishers & Distributors, 28th Revised Edition (2020).
2. Rangwala - Estimating, Costing and Valuation, Charotar Publishing House, 2023.
3. D.D. Kohli & R.C. Kohli - A Textbook of Estimating and Costing (Civil), S. Chand Publishing, 2011.

Reference Books:

1. M. Chakraborti - Estimating, Costing, Specification & Valuation in Civil Engineering, 29th Edition (2021).
2. Gurcharan Singh - Estimating, Costing and Valuation, Standard Publishers, 2018.
3. V.N. Vazirani & S.P. Chandola - Civil Engineering Estimating & Costing, Khanna Publishers, 4th Edition (2001).

E-Resources

https://onlinecourses.swayam2.ac.in/nou20_cs11/preview

<https://www.coursera.org/learn/construction-cost-estimating>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Apply estimation techniques to prepare detailed estimates for various construction projects.	L3
CO2	Develop abstract estimates and rate analysis for different civil engineering works.	L6
CO3	Analyse the preparation of measurement books and bill preparation as per AP State Government procedures	L4
CO4	Create detailed specifications and tender documents for construction projects.	L6
CO5	Assess building valuation, cost escalation, and value analysis techniques.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	1	-	2	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO3	3	3	3	2	2	-	2	1	-	-	-	1	3	3
CO4	3	3	3	2	2	-	2	1	-	-	-	1	3	3
CO5	2	2	2	1	3	-	3	1	-	1	1	2	2	2



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B.Tech. III Year I Semester

TINKERING LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0420P	0:0:2:0	1	CIE:30 SEE:70	3Hours	ES

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

Course objectives: The objectives of the course are to

1. Encourage Innovation and Creativity
2. Provide Hands-on Learning and Impart Skill Development
3. Foster Collaboration and Teamwork
4. Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
5. Impart Problem-Solving mind-set

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

Syllabus	Total Hours:48
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List Of Experiments :

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Design and 3D print a Walking Robot
3. Design and 3D Print a Rocket.
4. Temperature & Humidity Monitoring System (DHT11 + LCD)
5. Water Level Detection and Alert System
6. Automatic Plant Watering System
7. Bluetooth-Based Door Lock System
8. Smart Dustbin Using Ultrasonic Sensor
9. Fire Detection and Alarm System
10. RFID-Based Attendance System
11. Voice-Controlled Devices via Google Assistant
12. Heart Rate Monitoring Using Pulse Sensor
13. Soil Moisture-Based Irrigation
14. Smart Helmet for Accident Detection
15. Milk Adulteration Detection System
16. Water Purification via Activated Carbon
17. Solar Dehydrator for Food Drying
18. Temperature-Controlled Chemical Reactor
19. Ethanol Mini-Plant Using Biomass

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20. Smart Fluid Flow Control (Solenoid + pH Sensor)
21. Portable Water Quality Tester
22. AI Crop Disease Detection
23. AI-based Smart Irrigation
24. ECG Signal Acquisition and Plotting
25. AI-Powered Traffic Flow Prediction
26. Smart Grid Simulation with Load Monitoring
27. Smart Campus Indoor Navigator
28. Weather Station Prototype
29. Firefighting Robot with Sensor Guidance
30. Facial Recognition Dustbin
31. Barcode-Based Lab Inventory System
32. Growth Chamber for Plants
33. Biomedical Waste Alert System
34. Soil Classification with AI
35. Smart Railway Gate
36. Smart Bin Locator via GPS and Load Sensors
37. Algae-Based Water Purifier
38. Contactless Attendance via Face Recognition

Students need to refer to the following links:

Course Outcomes: The students will be able to experiment, innovate, and solve real-world challenges.

1. <https://aim.gov.in/pdf/equipment-manual-pdf.pdf>
2. <https://atl.aim.gov.in/ATL-Equipment-Manual/>
3. <https://aim.gov.in/pdf/Level-1.pdf>
4. <https://aim.gov.in/pdf/Level-2.pdf>
5. <https://aim.gov.in/pdf/Level-3.pdf>



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B.Tech. III Year I Semester

Electrical Safety Practices and Standards (Common to All Branches of Engineering Except EEE) (Open Elective-I)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0222T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-I

Course Objectives:

The objectives of the course are to make the students learn about:

- To impart knowledge on fundamentals of electrical safety, hazards of electricity, shocks, arc and blast, and preventive safety requirements.
- To familiarize students with various safety components such as conductors, insulators, voltage classifications, over-voltage protection, static electricity protection, electrical safety equipment, and fire extinguishers.
- To explain grounding and bonding concepts including system and equipment grounding, earthing practices, safe approach distances, and arc hazard categorization.
- To develop awareness on electrical safety practices, first aid, and safe handling of electrical tools, with applications in railways, swimming pools, lighting systems, and medical installations through case studies.
- To provide knowledge of standards, codes, rules, and statutory requirements related to electrical safety, including national and international standards.

Syllabus		Total Hours: 36Hrs
Unit-I	Introduction To Electrical Safety	8Hrs
Fundamentals of Electrical safety-Electric Shock- physiological effects of electric current - Safety requirements –Hazards of electricity- Arc - Blast- Causes for electrical failure.		
Unit-II	Safety Components	7Hrs
Introduction to conductors and insulators- voltage classification -safety against over voltages- safety against static electricity-Electrical safety equipment's - Fire extinguishers for electrical safety.		
Unit -III	Grounding	7Hrs
General requirements for grounding and bonding- Definitions- System grounding-Equipment grounding - The Earth - Earthing practices- Determining safe approach distance-Determining arc hazard category.		
Unit -IV	Safety Practices	7Hrs
General first aid- Safety in handling hand held electrical appliances tools- Electrical safety in train stations-swimming pools, external lighting installations, medical locations-Case studies.		
Unit -V	Standards For Electrical Safety	7Hrs
Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards- National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electrical inspectorate.		
Course Outcomes(CO): After the completion of the course students will able to:		
<ul style="list-style-type: none"> • Understanding the Fundamentals of Electrical Safety 		



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- Identifying and Applying Safety Components
- Analyzing Grounding Practices and Electrical Bonding
- Applying Safety Practices in Electrical Installations and Environments
- Evaluating Electrical Safety Standards and Regulatory Compliance

Textbooks:

1. Massimo A.G.Mitolo, Electrical Safety of Low-Voltage Systems, McGraw Hill, USA, 2009.
2. Mohamed El-Sharkawi, Electric Safety - Practice and Standards, CRC Press, USA, 2014

Reference Books:

1. Kenneth G.Mastrullo, Ray A. Jones, The Electrical Safety Program Book, Jones and Bartlett Publishers, London, 2nd Edition, 2011.
2. Palmer Hickman, Electrical Safety-Related Work Practices, Jones & Bartlett Publishers, London, 2009.
3. Fordham Cooper, W., Electrical Safety Engineering, Butterworth and Company, London, 1993.
4. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, Electrical Safety Hand book, McGraw-Hill, New York, USA, 4th edition, 2012



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B.Tech. III Year I Semester

Sustainable Energy Technologies

CSE, CSE-AIML, CSE-CS, CSE-DS, CE, ECE, EEE

(Open Elective – I)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0319T	3: 0: 0: 0	3	CIE:30 SEE:70	3 Hours	OEC

Course Objectives:

- Equip students with the ability to evaluate the Indian and global energy scenarios, including conventional and renewable energy status, per capita consumption, and future energy plans across sectors like domestic, industrial, commercial, agriculture, and transportation.
- Enable students to comprehend the principles of solar energy, including solar radiation measurement, thermal collectors, photovoltaic conversion, and their applications, while analyzing solar energy storage and system design.
- Develop students' skills to assess wind energy resources, understand wind turbine types (horizontal and vertical axis), performance characteristics, site selection, and environmental impacts, along with exploring hybrid systems and applications.
- Provide students with knowledge of bio-energy resources, conversion processes (thermochemical, biochemical, and mechanical), biomass gasifiers, cogeneration, and biofuel production (biodiesel and ethanol), emphasizing their practical applications.
- Enable students to examine the principles, technologies, and environmental impacts of small hydro, tidal, wave, and ocean thermal energy conversion (OTEC) systems, as well as geothermal energy sources and power plant types, focusing on their applications and limitations.

Syllabus		Total Hours:48
Unit – I	Energy Scenario	8 Hrs
Indian energy scenario in various sectors – domestic, industrial, commercial, agriculture, transportation and others – Present conventional energy status – Present renewable energy status-Potential of various renewable energy sources-Global energy status-Per capita energy consumption - Future energy plans		
Unit – II	Solar Energy	10Hrs
Solar radiation – Measurements of solar radiation and sunshine – Solar spectrum - Solar thermal collectors – Flat plate and concentrating collectors – Solar thermal applications – Solar thermal energy storage – Fundamentals of solar photo voltaic conversion – Solar cells – Solar PV Systems – Solar PV applications.		
Unit – III	Wind Energy	10 Hrs
Wind data and energy estimation – Betz limit - Site selection for windfarms – characteristics – Wind resource assessment - Horizontal axis wind turbine – components - Vertical axis wind turbine – Wind turbine generators and its performance – Hybrid systems – Environmental issues - Applications.		
Unit - IV	Bio-Energy	10 Hrs
Bio resources – Biomass direct combustion – thermochemical conversion – biochemical conversion-mechanical conversion - Biomass gasifier - Types of biomass gasifiers – Cogeneration -- Carbonisation – Pyrolysis - Biogas plants – Digesters – Biodiesel production – Ethanol production - Applications.		
Unit - V	Ocean And Geothermal Energy	10 Hrs
Small hydro - Tidal energy – Wave energy – Open and closed OTEC Cycles – Limitations – Geothermal energy – Geothermal energy sources - Types of geothermal power plants – Applications - Environmental impact.		
Course Outcomes(CO):		

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- Explain Indian and global energy scenarios, consumption patterns, and renewable energy potential.
- Describe solar energy principles, collectors, storage, and photovoltaic system applications.
- Interpret wind energy concepts, including wind data, Betz limit, turbine types, and environmental impacts.
- Summarize bio-energy production processes, gasifiers, biodiesel, ethanol, and their applications.
- Classify ocean and geothermal energy systems, their types, applications, limitations, and environmental impacts.

Text Books:

1. Tester, J. W., Drake, E. M., Driscoll, M. J., Golay, M. W., Peters, W. A., Sustainable Energy: Choosing Among Options, MIT Press, 2012, 2nd Edition.
2. Martin A. Abraham, Encyclopedia of Sustainable Technologies, Elsevier Publications, 2024, 2nd Edition, 2024.
3. Eduardo Rincon-Mejia, Alejandro de las Heras, Sustainable Energy Technologies, CRC Press, 2018.
4. Denise Fairchild, Al Weinrub, Energy democracy: Advancing equity in clean energy solutions, Island press, 2017.

Reference Books:

1. Mulligan, C. N., Sustainable Engineering: Principles and Implementation, CRC Press, Taylor and Francis Group, 2019.
2. Bakshi, B. R., Sustainable Engineering: Principles and Practice, Cambridge University Press, 2019.
3. David Allen, David Shonnard, Sustainable Engineering: Concepts, Design, and Case Studies, Prentice Hall, 2011.
4. Hazra Somnath, Bhukta Anindya, Sustainable Development Goals an Indian Perspective, Springer, 2020.

Web References:

1. <https://www.youtube.com/watch?v=HNjwoe4mSkE&list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r>



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B.Tech. III Year I Semester

Electronic Circuits

(Common To All Branches of Engineering Except ECE)

(Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0442T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I
Course Objectives: The objectives of the course are to make the students learn about					
<ul style="list-style-type: none"> To understand semiconductor diodes, their characteristics and applications. To explore the operation, configurations, and biasing of BJTs. To study the operation, analysis, and coupling techniques of BJT amplifiers. To learn the operation, applications and uses of feedback amplifiers and oscillators. To analyze the characteristics, configurations, and applications of operational amplifiers. 					
Syllabus				Total Hours:36	
Unit-I	Semiconductor Diode and Applications			8Hrs	
<p>Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).</p> <p>Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode.</p>					
Unit-II	Bipolar Junction Transistor (BJT)			7Hrs	
<p>Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes</p>					
Unit-III	Single stage & Multistage amplifiers			7Hrs	
<p>Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model</p> <p>Multistage amplifiers: Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).</p>					
Unit-IV	Feedback amplifiers & Oscillators			7Hrs	
<p>Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).</p> <p>Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator, Crystal Oscillator.</p>					
Unit-V	Op-amp and Application			7Hrs	
<p>Op-amp: Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.</p> <p>Applications of op-amp : Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator</p>					



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Course Outcomes (CO):

Upon completion of this course, students should be able to:

- Understand semiconductor diodes, their characteristics.
- Understand semiconductor devices applications as Rectifiers and Clipping circuits
- Explore the operation, configurations, and biasing of BJTs.
- Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.
- Learn the operation, applications and uses of feedback amplifiers and oscillators.
- Analyze. the characteristics, configurations, and applications of operational amplifiers

Text Books:

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill,2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008.

Reference Books:

1. Electronics Devices and Circuits Theory, R.L.Boylestad, LouisNashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press.

Online Learning Resources:

- <https://archive.nptel.ac.in/courses/105/104/105104161/>
- <https://archive.nptel.ac.in/courses/105/103/105103093/>



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B.Tech. III Year I Semester

Java Programming

(Common to all branches of Engineering except CSE & allied)

(Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0545T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives: The objectives of the course are to make the students learn about

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java apis for program development

Syllabus

Total Hours:36

Unit-I

Object Oriented Programming

8Hrs

Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if-else Expressions, Ternary Operator?;, Switch Statement, Iteration Statements, while Expression, do-while Loop, for Loop, Nested for Loop, For-Each for Loop, Break Statement, Continue Statement.

Unit-II

Classes, Objects & Methods

7Hrs

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

Unit-III

Arrays, Inheritance, Interfaces

7Hrs

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.



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Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

Unit-IV

Packages, Java Library, Exception Handling, Java I/O and File

7Hrs

Packages and Java Library : Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java. lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto un boxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java. .Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throw able, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

Unit-V

String Handling, Multithreaded Programming, Java FX GUI

7Hrs

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter thread Communication - Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing My SQL and My SQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Course Outcomes(CO):

Upon completion of this course, students should be able to:

- Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.
- Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects
- Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.
- Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.
- Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.
- Choose appropriate data structure of Java to solve a problem

Text Books:

- Anitha Seth, B.L. Juneja, JAVA one step ahead, Oxford.
- Debasis Samanta, Monalisa Sarma, Joy with JAVA, Fundamentals of Object Oriented Programming, Cambridge, 2023.
- Paul Deitel, Harvey Deitel, JAVA 9 for Programmers, 4th Edition, Pearson.

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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.**Reference Books:**

1. The complete Reference Java, 11th edition, Herbert Schildt, TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Learning Resources:

- <https://nptel.ac.in/courses/106/105/106105191/>
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview



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B.Tech. III Year I Semester

Fundamentals of Artificial Intelligence

(Common to all branches of Engineering except CSE allied)

(Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0546T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives: The objectives of the course are to make the students learn about

- To learn the distinction between optimal reasoning Vs. human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Syllabus

Total Hours:36

Unit-I	Introduction to AI	8Hrs
Introduction to AI - Intelligent Agents, Problem-Solving Agents, Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces		
Unit-II	Games, Logic	7Hrs
Games - Optimal Decisions in Games, Alpha-Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic - Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.		
Unit-III	First-Order Logic & Knowledge Representation	7Hrs
First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First- Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution. Knowledge Representation: Ontological Engineering, Categories and Objects, Events		
Unit-IV	Planning	7Hrs
Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.		
Unit-V	Probabilistic Reasoning	7Hrs
Probabilistic Reasoning: Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.		

Course Outcomes(CO):

Upon completion of this course, students should be able to:

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.
- Understand the concepts of state space representation, exhaustive search, heuristic search

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together with the time and space complexities.

- Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- Analyze Supervised Learning Vs. Learning Decision Trees

Text Books:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

Reference Books:

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

Online Learning Resources:

- <https://ai.google/>
- https://swayam.gov.in/nd1_noc19_me71/preview



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B.Tech. III Year I Semester

Quantum Technologies and Applications

(Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0547T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I
Course Objectives: The objectives of the course are to make the students learn about					
<ul style="list-style-type: none"> To learn the distinction between optimal reasoning Vs. human like reasoning. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities. To learn different knowledge representation techniques. To understand the applications of AI, namely game playing, theorem proving, and machine learning. 					
Syllabus					Total Hours:36
Unit-I	Fundamentals of Quantum Mechanics				8Hrs
<ul style="list-style-type: none"> Classical vs Quantum Paradigm Postulates of Quantum Mechanics Wavefunction and Schrödinger Equation (Time-independent) Quantum states, Superposition, Qubits Measurement, Operators, and Observables Entanglement and Non-locality 					
Unit-II	Quantum Computing				7Hrs
<ul style="list-style-type: none"> Qubits and Bloch Sphere Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates Quantum Circuits Basic Algorithms: Deutsch-Jozsa. Grover's, Shor's (conceptual) Error Correction and Decoherence 					
Unit-III	Quantum Communication and Cryptography				7Hrs
<ul style="list-style-type: none"> Teleportation & No-Cloning BB84 Protocol Quantum Networks & Repeaters Classical vs Quantum Cryptography Challenges in Implementation 					
Unit-IV	Quantum Sensors and Metrology				7Hrs
<ul style="list-style-type: none"> Quantum Sensing: Principles and Technologies Quantum-enhanced Measurements Atomic Clocks, Gravimeters Magnetometers, NV Centers Industrial Applications 					
Unit-V	Quantum Materials and Emerging Technologies				7Hrs
<ul style="list-style-type: none"> Quantum Materials: Superconductors, Topological Insulators Quantum Devices: Qubits, Josephson Junctions National Quantum Missions (India, EU, USA, China) Quantum Careers and Industry Initiatives 					
Course Outcomes(CO):					

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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.**Upon completion of this course, students should be able to:**

- Understand key quantum mechanical concepts and phenomena.
- Comprehend the structure and function of quantum algorithms and circuits.
- Explore applications in quantum communication and cryptography.
- Appreciate the role of quantum technologies in modern engineering systems.

Text Books:

1. "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press)
2. "Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman (Basic Books)

Reference Books:

1. "Quantum Computing for Everyone" by Chris Bernhardt (MIT Press)
2. "Quantum Physics: A Beginner's Guide" by Alastair I.M. Rae
3. "An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca
4. IBM Quantum Experience and Qiskit Documentation (<https://qiskit.org>)



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B.Tech. III Year I Semester

Mathematics for Machine Learning and AI (Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0027T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives: The objectives of the course are to make the students learn about

- To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.
- To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.
- To equip students with optimization techniques and graph-based methods used in AI applications.
- To develop critical problem-solving skills for analysing mathematical formulations in AI/ML.

Syllabus

Total Hours:36

Unit-I	Linear Algebra for Machine Learning	8Hrs
Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).		
Unit-II	Probability and Statistics for AI	7Hrs
Probability distributions: Gaussian, Binomial, Poisson. Bayes' Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP). Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.		
Unit-III	Optimization Techniques for ML	7Hrs
Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton's method, BFGS method.		
Unit-IV	Vector Calculus & Transformations	7Hrs
Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.		
Unit-V	Graph Theory for AI	7Hrs
Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).		

Course Outcomes(CO):

Upon completion of this course, students should be able to:

- Apply linear algebra concepts to ML techniques like PCA and regression.
- Analyze probabilistic models and statistical methods for AI applications.
- Implement optimization techniques for machine learning algorithms.
- Utilize vector calculus and transformations in AI-based models.
- Develop graph-based AI models using mathematical representations.

Text Books:

1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.
2. Pattern Recognition and Machine Learning by Christopher Bishop, Springer

Reference Books:

1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.
2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

Web References:

- MIT– Mathematics for Machine Learning <https://ocw.mit.edu>
- Stanford CS229 – Machine Learning Course <https://cs229.stanford.edu/>
- DeepAI – Mathematical Foundations for AI <https://deeptai.org>



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B.Tech. III Year I Semester

Materials Characterization Techniques (Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0034T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives: The objectives of the course are to make the students learn about

- To provide exposure to different characterization techniques.
- To explain the basic principles and analysis of different spectroscopic techniques.
- To elucidate the working of Scanning electron microscope - Principle, limitations and applications.
- To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.
- To educate the uses of advanced electric and magnetic instruments for characterization.

Syllabus

Total Hours:36

Unit-I	Structure analysis by Powder X-Ray Diffraction	8Hrs
Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle Xray scattering (SAXS) (in brief).		
Unit-II	Microscopy technique -1 –Scanning Electron Microscopy (SEM)	7Hrs
Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.		
Unit-III	Microscopy Technique -2 - Transmission Electron Microscopy (TEM)	7Hrs
Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy		
Unit-IV	Spectroscopy techniques	7Hrs
Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).		
Unit-V	Electrical & Magnetic Characterization techniques	7Hrs
Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.		

Course Outcomes(CO):

Upon completion of this course, students should be able to:

- Analyze the crystal structure and crystallite size by various methods
- Analyze the morphology of the sample by using a Scanning Electron Microscope
- Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope
- Explain the principle and experimental arrangement of various spectroscopic techniques
- Identify the construction and working principle of various Electrical & Magnetic Characterization technique

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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.**Text Books:**

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013.
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

Reference Books:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine, M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall , 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications – Khalid Sultan – Wiley – 2021.
4. Materials Characterization Techniques -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008

NPTEL courses link :

- <https://nptel.ac.in/courses/115/103/115103030/>
- https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
- <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/>



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B.Tech. III Year I Semester

Chemistry of Energy Systems (Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0040T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives: The objectives of the course are to make the students learn about

- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications
- Necessarily of harnessing alternate energy resources such as solar energy and its basic concepts.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method.

Syllabus

Total Hours:36

Unit-I	Electrochemical Systems	8Hrs
Electrochemical Systems: Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction ,Lead-acid ,Nickel- cadmium, Lithium ion batteries and their applications.		
Unit-II	Fuel Cells	7Hrs
Fuel Cells: Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.		
Unit-III	Photo and Photo electrochemical Conversions	7Hrs
Photo and Photo electrochemical Conversions: Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.		
Unit-IV	Solar Energy	7Hrs
Solar Energy: Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications.		
Unit-V	Hydrogen Storage	7Hrs
Hydrogen Storage: Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers.		

Course Outcomes(CO):

Upon completion of this course, students should be able to:

- Solve the problems based on electrode potential, Describe the Galvanic Cell
- Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer
- Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell
- Discuss about the Basic design of fuel cells, Classify the fuel cell
- Differentiate between Photo and Photo electrochemical Conversions,
- Illustrate the photochemical cells, Identify the applications of photochemical reactions,



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- Interpret advantages of photoelectron catalytic conversion.
- Apply the photo voltaic technology, Demonstrate about solar energy and prospects
- Illustrate the Solar cells, Discuss about concentrated solar power
- Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic framework, Illustrate the carbon and metal oxide porous structures
- Describe the liquification methods.

Text Books:

1. Ira N. Levine, Physical Chemistry, McGraw Hill Education, 7th Edition, 2013.
2. A. Bahl, B. S. Bahl, G. D. Tuli, Essentials of Physical Chemistry, S. Chand & Company Ltd., 25th Edition (Revised), 2011.
3. Peter Atkins, Tina Overton, Jonathan Rourke, Mark Weller, Fraser Armstrong (commonly cited as Atkins & Overton et al.), Shriver & Atkins' Inorganic Chemistry, Oxford University Press, 6th Edition, 2014.

Reference Books:

1. U.S. Department of Energy, EG&G Technical Services, Inc., Fuel Cell Handbook, U.S. Department of Energy, 7th Edition, 2004.
2. Arvind Tiwari, Shyam, Handbook of Solar Energy and Applications, Narosa Publishing House, 1st Edition, 2009.
3. Klaus Jäger, Oliver Brendel, Holger Lux Steiner, Lutz Treiber, Wolfram Warta (et al.), Solar Energy: Fundamentals, Technology and Systems, Wiley VCH, 1st Edition, 2016.
4. Philip L. Klebanoff (edited by, Sandia National Laboratories, U.S. DOE), Hydrogen Storage Technology: Materials and Applications, CRC Press (Taylor & Francis), 1st Edition, 2012.



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B.Tech. III Year I Semester

English for Competitive Examinations (Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0044T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives: The objectives of the course are to make the students learn about

- To enable the students to learn about the structure of competitive English
- To understand the grammatical aspects and identify the errors
- To enhance verbal ability and identify the errors
- To improve word power to answer competitive challenges
- To make them ready to crack competitive exams

Syllabus

Total Hours:36

Unit-I	GRAMMAR-1	8Hrs
Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite- indefinite- Degrees of Comparison-Adverbs-types- errors-Conjunctions-usage- Prepositions-usage-Tag Questions, types-identifying errors- Practice		
Unit-II	GRAMMAR-2	7Hrs
Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause- Voice-active voice and passive voice- reported Speech-Agreement- subject and verb-Modals-Spotting Errors-Practices		
Unit-III	VERBAL ABILITY	7Hrs
Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction- Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.		
Unit-IV	READING COMPREHENSION AND VOCUBULARY	7Hrs
Competitive Vocabulary :Word Building – Memory techniques-Synonyms, Antonyms, Affixes-Prefix & Suffix-One word substitutes-Compound words-Phrasal Verbs-Idioms and Phrases-Homophones- Linking Words-Modifiers-Intensifiers - Mastering Competitive Vocabulary- Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering–Elimination methods		
Unit-V	WRITING FOR COMPETITIVE EXAMINATIONS	7Hrs
Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types- Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs-Essay writing-types		

Course Outcomes(CO):

Upon completion of this course, students should be able to:

- Identify the basics of English grammar and its importance.
- Explain the use of grammatical structures in sentences.
- Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams
- Analyze an unknown passage and reach conclusions about it.
- Choose the appropriate form of verbs in framing sentences.

- Develop speed reading and comprehending ability thereby perform better in competitive exams



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Text Books:

1. Wren & Martin, English for Competitive Examinations, S.Chand & Co,2021
2. Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.

Reference Books:

1. Hari Mohan Prasad, Objective English for Competitive Examination, Tata McGraw Hill, New Delhi, 2014.
2. Philip Sunil Solomon, English for Success in Competitive Exams, Oxford 2016
3. Shalini Verma , Word Power Made Handy, S Chand Publications
4. Neira, Anjana Dev & Co. Creative Writing: A Beginner's Manual. Pearson Education India, 2008.
5. Abhishek Jain, Vocabulary Learning Techniques Vol.I&II,RR Global Publishers 2013.
6. Michel Swan, Practical English Usage,Oxford,2006.

Web References:

- <https://www.grammar.cl/english/parts-of-speech.htm>
- <https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech>
- <https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passivevoice>
- <https://languagetool.org/insights/post/verb-tenses/>
- <https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council>
- <https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx>



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B.Tech. III Year I Semester

Entrepreneurship and New Venture Creation (Open Elective-I)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0051T	3:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives: The objectives of the course are to make the students learn about

- To foster an entrepreneurial mind-set for venture creation and intrapreneurial leadership.
- To encourage creativity and innovation
- To enable them to learn pitching and presentation skills
- To make the students understand MVP development and validation techniques to determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept.
- To enhance the ability of analyzing Customer and Market segmentation, estimate Market size, develop and validate Customer Persona

Syllabus

Total Hours:36

Unit-I	Entrepreneurship Fundamentals and context	8Hrs
<p>Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.</p> <p>Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16industries to choose from), Venture Activity</p>		
Unit-II	Problem & Customer Identification	7Hrs
<p>Understanding and analysing the macro-Problem and Industry perspective - technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion - identifying and defining problem using Design thinking principles - Analysing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.</p> <p>Core Teaching Tool: Several types of activities including Class, game, Gen AI, 'Get out of the Building' and Venture Activity.</p>		
Unit-III	Solution design, Prototyping & Opportunity Assessment and Sizing	7Hrs
<p>Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.</p> <p>Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity</p>		
Unit-IV	Business & Financial Model, Go-to-Market Plan	7Hrs
<p>Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach.</p> <p>Business planning: components of Business plan- Sales plan, People plan and financial plan.</p> <p>Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.</p> <p>Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy.</p> <p>Choosing a form of business organization specific to your venture, identifying sources of funds:</p>		



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Debt & Equity, Map the Start-up Life-cycle to Funding Options.
Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

Unit-V	Scale Outlook and Venture Pitch readiness	7Hrs
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Understand and identify potential and aspiration for scale vis-a-vis your venture idea.
Persuasive Storytelling and its key components. Build an Investor ready pitch deck.
Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

Course Outcomes(CO):

Upon completion of this course, students should be able to:

- Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship
- Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution
- Analyze and refine business models to ensure sustainability and profitability
- Build Prototype for Proof of Concept and validate MVP of their practice venture idea
- Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture
- Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders

Text Books:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha . Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business,(2011).
3. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

Reference Books:

1. Simon Sinek, Start with Why, Penguin Books limited. (2011)
2. Brown Tim, Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business.(2019)
4. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
5. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd.

E-RESOURCE

Learning resource- Ignite 5.0 Course Wadhvani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

Member Secretary

Head of the Department,
 Dept. of Civil Engineering
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B.Tech. III Year II Semester

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	PC	23A0125T	Design of Steel Structures	3	0	0	3
2	PC	23A0126T	Highway Engineering	3	0	0	3
3	PC	23A0127T	Environmental Engineering	3	0	0	3
4	PE	23A0128T	Professional Elective-II 1. Design of Earthquake Resistant Structures 2. Open Channel Flow 3. Foundation Engineering	3	0	0	3
		23A0129T					
		23A0130T					
5	PE	23A0131T	Professional Elective-III 1. Cost effective Housing Techniques 2. Watershed Management 3. Advanced Structural Analysis	3	0	0	3
		23A0132T					
		23A0133T					
6	OE		Open Elective-II	3	0	0	3
7	PC	23A0134P	Highway Engineering Lab	0	0	3	1.5
8	PC	23A0135P	Environmental Engineering Lab	0	0	3	1.5
9	SEC	23A0136P	Skill oriented course Building Information Modelling	0	1	2	2
10	MC	23A0053T	Mandatory non credit course Technical paper writing & IPR	2	0	0	-
Total Credits							23

Mandatory Industry Internship of 08 weeks duration during summer vacation (23A0146P)

Open Elective-II

SL. No	Course Code	Branch	Course Name
1	23A0232T	EEE	Renewable Energy Sources
2	23A0328T	ME	Automation and Robotics
3	23A0443T	ECE	Digital Electronics
4	23A0548T	CSE& Allied/IT	Fundamentals of Operating Systems
5	23A0529T		Machine Learning
6	23A0030T	Mathematics	Optimization Techniques
	23A0029T		Mathematical Foundation of Quantum Technologies



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7	23A0035T	Physics	Physics of Electronic Materials and Devices
8	23A0041T	Chemistry	Chemistry of Polymers and Applications
9	23A0045T	Humanities	Academic Writing and Public Speaking

Category	CREDITS
Professional Core Course (PC)	12
Professional Elective Course (PE)	6
Open Elective Course (OE)	3
Skill Enhancement Course (SEC)	2
TOTALCREDITS	23

Member Secretary

Head of the Department,
Dept. of Civil Engineering
GEETHANJALI INSTITUTE OF
SCIENCE & TECHNOLOGY
GANGAVARAM (V), Kovur (M),
S.P.S.R. Nellore Dt. A.P. Pin: 524-137.

CE-HOD



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B.Tech. III Year II Semester

DESIGN OF STEEL STRUCTURES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0125T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the properties, types, and applications of structural steel in construction.
2. Analyse the behavior and design of bolted and welded connections for steel structures.
3. Design tension and compression members, including built-up members and column bases.
4. Develop steel structural elements such as beams, plate girders, roof trusses, and gantry girders.
5. Apply plastic analysis concepts to the design of continuous beams and portal frames.

Syllabus		Total Hours: 48
Unit-I	Introduction To Structural Steel And Design Of Connections	10Hrs
General -Types of Steel -Properties of Structural Steel - I.S. Rolled Sections - Concept of Limit State Design - Design of Simple and Eccentric Bolted and Welded Connections - Types of Failure and Efficiency of Joint – Prying Action - Introduction to HSEFG bolts		
Unit-II	Design Of Tension And Compression Members	10Hrs
Behaviour and Design of Simple and Built-Up Members Subjected to Tension - Shear Lag Effect Design of Lug Angles - Tension Splice - Behaviour of Short and Long Columns - Euler's Column Theory Design of Simple and Built-Up Compression Members With Lacings and Battens - Design of Column Bases - Slab Base and Gusseted Base		
Unit-III	Design Of Beams	8Hrs
Design of Laterally Supported and Unsupported Beams - Design of Built-Up Beams - Design of Plate Girders		
Unit-IV	Industrial Structures	10Hrs
Design of Roof Trusses – Loads On Trusses – Purlin Design Using Angle and Channel Sections – Truss Design, Design of Joints and End Bearings–Design of Gantry Girder - Introduction to Pre-Engineered Buildings		
Unit-V	Plastic Analysis And Design	10Hrs
Introduction to Plastic Analysis - Theory of Plastic Analysis - Design of Continuous Beams and Portal Frames Using Plastic Design Approach.		

Text Books:

1. Duggal S.K., Design of Steel Structures, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2010
2. Bhavikatti S.S, Design of Steel Structures, Iik International Publishing House, New Delhi, 2017.

Reference Books:

1. Gambhir M L, Fundamentals of Structural Steel Design, McGraw Hill Education India Pvt Limited, 2013
2. Jack C. McCormac & Stephen F. Csernak - Structural Steel Design, Pearson, 7th Edition, 2023.
3. William T. Segui & Farid Soleimani - Steel Design, Cengage, 7th Edition, 2023.
4. SarwarAlamRaz, Structural Design in Steel, New Age International Publishers, 2014
5. Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi, 2016



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Online Learning Resources:

<https://nptel.ac.in/courses/105105162>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the properties of structural steel, types of sections, and the concept of limit state design.	L2
CO2	Analyse and design bolted and welded connections for structural steel members.	L4
CO3	Design tension and compression members, including built-up sections and column bases.	L6
CO4	Develop design solutions for beams, plate girders, roof trusses, and gantry girders.	L6
CO5	Perform plastic analysis and design of continuous beams and portal frames.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	1	1	-	1	-	2	2	2	2
CO2	3	2	2	2	1	1	1	-	1	-	2	2	1	1
CO3	3	2	2	2	1	-	-	-	1	-	2	2	2	1
CO4	3	2	2	2	1	-	-	-	1	-	2	2	1	1
CO5	3	2	2	2	1	-	-	-	1	-	2	2	2	2



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B.Tech. III Year II Semester

HIGHWAY ENGINEERING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0126T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the history, importance, and planning aspects of highway development in India.
2. Apply geometric design principles for highway alignment, sight distance, and curves.
3. Analyse traffic characteristics, capacity, level of service, and road safety measures.
4. Design flexible and rigid pavements using IRC guidelines.
5. Evaluate highway construction materials, testing methods, and maintenance techniques.

Syllabus		Total Hours: 48
Unit-I	Planned Highway Development In India	8Hrs
Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.		
Unit-II	Geometric Design Of Highways	10Hrs
Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment-Gradients- Vertical curves.		
Unit-III	Traffic Engineering Studies	10Hrs
Basic Parameters of Traffic-Volume, Speed and Density – Definitions and their inter relation – Highway capacity and level of service concept – factors affecting capacity and level of service - Traffic Volume Studies- Data Collection and Presentation-Speed studies- Data Collection and Presentation- - Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams.		
Unit-IV	Intersection Design	10Hrs
Conflicts at Intersections- Channelization: Objectives –Traffic Islands and Design criteria- Types of At-Grade Intersections – Types of Grade-Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersections. Types of Pavements – Difference Between Flexible and Rigid Pavements – Pavement Components – Sub Grade, Sub Base, Base and Wearing Course – Functions of Pavement Components – Design Factors		
Unit-V	Design of Flexible Pavement	10Hrs
Flexible Pavement Design Methods – G.I Method, CBR Method, (As Per IRC 37-2002) –Design of Rigid Pavements – Critical Load Positions – Westergaard's Stress Equations – Computing Radius of Relative Stiffness and Equivalent Radius of Resisting Section – Stresses in Rigid Pavements – Design of Expansion and Contraction Joints in CC Pavements. Design of Dowel Bars and Tie Bars.		

Text Books:

1. Highway Engineering – S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 9th edition (2011).
2. Transportation Engineering, Volume I, C Venkatramaiah, Universities Press, 2015

Reference Books:

1. Principles of Highway Engineering by L.R.Kadiyali, Khanna Publishers



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2. Traffic Engineering and Transportation Planning by L.R.Kadiyali and Lal- Khanna Publications 9th edition

3. Highway Engineering – Dr. S.K.Sharma, S.Chand Publishers 2014 edition

Online Learning Resources:

<https://nptel.ac.in/courses/105101087>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the significance, planning, and alignment of highways.	L2
CO2	Design geometric elements of highways, including curves, gradients, and sight distances.	L6
CO3	Analyse traffic flow, capacity, level of service, and implement road safety measures.	L4
CO4	Design flexible and rigid pavements as per IRC guidelines.	L6
CO5	Assess construction practices, highway materials, and pavement maintenance techniques.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	-	-	-	-	1	-	2	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO3	3	3	3	2	2	-	2	1	-	-	-	1	3	3
CO4	3	3	3	2	2	-	2	1	-	-	-	1	3	3
CO5	2	2	2	1	3	-	3	1	-	1	1	2	2	2



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B.Tech. III Year II Semester

ENVIRONMENTAL ENGINEERING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0127T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the sources, demand estimation, and quality parameters of water.
2. Apply water treatment processes for purification and supply.
3. Analyse storage, distribution, and operation of water supply systems.
4. Design sewerage systems, stormwater drainage, and plumbing networks.
5. Evaluate sewage treatment, sludge management, and water reuse methods.

Syllabus	Total Hours: 48
Unit-I	Introduction to Water Supply 8Hrs
Estimation of Surface and Subsurface Water Resources - Predicting Demand for Water- Impurities of Water and Their Significance - Physical, Chemical and Bacteriological Analysis - Waterborne Diseases - Standards for Potable Water. Intake of Water: Pumping and Gravity Schemes.	
Unit-II	Water Treatment 10Hrs
Objectives - Unit Operations and Processes - Principles, Functions, and Design of Water Treatment Plant Units, Aerators of Flash Mixers, Coagulation and Flocculation – Clarifloccuator- Plate and Tube Settlers – Pulsator Clarifier - Sand Filters - Disinfection - Softening, Removal of Iron and Manganese – De fluoridation- Softening - Desalination Process - Residue Management - Construction, Operation and Maintenance Aspects	
Unit-III	Water Storage And Distribution 10Hrs
Storage and Balancing Reservoirs - Types, Location and Capacity. Distribution System: Layout, Hydraulics of Pipe Lines, Pipe Fittings, Valves Including Check and Pressure Reducing Valves, Meters, Analysis of Distribution Systems, Leak Detection, Maintenance of Distribution Systems, Pumping Stations and Their Operations - House Service Connections.	
Unit-IV	Planning And Design Of The Sewerage System 10Hrs
Characteristics and Composition of Sewage - Population Equivalent - Sanitary Sewage Flow Estimation - Sewer Materials - Hydraulics of Flow in Sanitary Sewers - Sewer Design - Storm Drainage-Storm Runoff Estimation - Sewer Appurtenances - Corrosion in Sewers - Prevention and Control – Sewage Pumping- Drainage in Buildings - Plumbing Systems for Drainage	
Unit-V	Sewage Treatment And Disposal 10Hrs
Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process and Extended Aeration Systems - Trickling Filters - Sequencing Batch Reactor(SBR) - UASB - Waste Stabilization Ponds - Other Treatment Methods - Reclamation and Reuse of Sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance Aspects. - Discharge Standards-Sludge Treatment -Disposal of Sludge	

Text Books:

1. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering, I and II by BC Punmia, Std. Publications.



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Reference Books:

1. Environmental Engineering, I and II by SK Garg, Khanna Publications.
2. Environmental Pollution and Control Engineering CS Rao, Wiley Publications
3. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
4. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
5. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr. Wiley, 2007.

Online Learning Resources:

<https://nptel.ac.in/courses/103107084>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain water sources, quality standards, and waterborne diseases.	L2
CO2	Design unit processes of water treatment plants.	L6
CO3	Analyse water distribution networks and pumping stations.	L4
CO4	Design sewerage systems, including stormwater and sanitary sewers.	L6
CO5	Assess sewage treatment methods and advanced wastewater management techniques.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	-	3	3	1	-	1	-	2	3	3
CO2	3	3	3	2	2	2	2	1	-	-	-	1	3	3
CO3	3	3	3	2	2	2	3	1	-	-	-	1	3	3
CO4	3	3	3	2	2	2	3	1	-	-	-	1	3	3
CO5	2	2	2	1	3	3	3	1	-	1	1	2	2	2



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B.Tech. III Year II Semester

DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0128T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE - II

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental concepts of engineering seismology, including earthquake phenomena, seismic waves, and measuring instruments.
2. Analyse the principles of structural vibrations, degrees of freedom, and dynamic response of structures to earthquake ground motions.
3. Evaluate conceptual design strategies, seismic design principles, and methods for improving earthquake resistance in structures.
4. Apply earthquake-resistant design principles to reinforced concrete and masonry buildings using IS codes and lateral force methods.
5. Assess the role of structural walls, non-structural elements, and ductility considerations in enhancing earthquake resistance.

Syllabus		Total Hours: 48
Unit-I	Engineering Seismology & Theory of Vibrations	10Hrs
Engineering Seismology: Earthquake Phenomenon - Cause of Earthquakes-Faults- Plate Tectonics- Seismic Waves- Terms Associated with Earthquakes-Magnitude/Intensity of An Earthquake-Scales- Energy Released- Earthquake Measuring Instruments Seismogram - Seismoscope, Seismograph, - Strong Ground Motions- Seismic Zones of India.; Theory of Vibrations: Elements of A Vibratory System- Degrees of Freedom- Continuous System- Lumped Mass Idealization-Oscillatory Motion-Simple Harmonic Motion-Free Vibration of Single Degree of Freedom (SDOF) System- Undamped and Damped-Critical Damping-Logarithmic Decrement-Forced Vibrations-Harmonic Excitation-Dynamic Magnification Factor-Excitation by Rigid Based Translation for SDOF System-Earthquake Ground Motion.		
Unit-II	Conceptual Design & Earthquake Resistant Design	10Hrs
Conceptual Design: Introduction-Functional Planning-Continuous Load Path-Overall form-Simplicity and Symmetry-Elongated Shapes-Stiffness and Strength-Horizontal and Vertical Members-Twisting of Buildings-Ductility-Ductility Relationships-Flexible Buildings-Framing Systems-Choice of Construction Materials-Unconfined Concrete-Confined Concrete-Masonry-Reinforcing Steel.; Introduction to Earthquake Resistant Design: Seismic Design Requirements-Regular and Irregular Configurations-Basic Assumptions-Design Earthquake Loads-Basic Load Combinations-Permissible Stresses-Seismic Methods of Analysis-Factors in Seismic Analysis-Equivalent Lateral force Method.		
Unit-III	Reinforced Concrete Buildings	10Hrs
Principles of Earthquake Resistant Design of RC Members- Structural Models for Frame Buildings - Seismic Methods of Analysis- Is Code Based Methods for Seismic Design - Vertical Irregularities - Plan Configuration Problems- Lateral Load Resisting Systems- Determination of Design Lateral forces as Per Is 1893 (Part-1):2016- Equivalent Lateral force Procedure- Lateral Distribution of Base Shear.		
Unit-IV	Masonry Buildings	8Hrs
Introduction- Elastic Properties of Masonry Assemblage- Categories of Masonry Buildings- Behaviour of Unreinforced and Reinforced Masonry Walls- Behavior of Walls- Box Action and Bands- Behaviour of Infill Walls- Improving Seismic Behaviour of Masonry Buildings- Load Combinations and Permissible Stresses-Seismic Design Requirements- Lateral Load Analysis of Masonry Buildings.		



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Unit-V	Structural Walls and Non-Structural Elements	10Hrs
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Strategies in The Location of Structural Walls- Sectional Shapes- Variations in Elevation- Cantilever Walls Without Openings – Failure Mechanism of Non-Structures- Effects of Non-Structural Elements On Structural System- Analysis of Non-Structural Elements- Prevention of Non-Structural Damage Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors Affecting Ductility- Ductile Detailing Considerations as Per IS 13920-2016 - Behaviour of Beams, Columns and Joints in RC Buildings During Earthquakes

Text Books:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N.Iyengar, I.K. International Publishing House Pvt. Ltd.
4. Masonry and Timber structures including earthquake Resistant Design – Anand S. Arya, Nemchand & Bros
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy
6. BIS Codes: 1. IS 1893(Part-1):2016 or Latest codes; 2. IS 13920:2016. 3. IS 4326. 4. IS 456:2000 or latest.

Online Learning Resources:

<https://nptel.ac.in/courses/105107204>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain earthquake mechanisms, seismic waves, and seismic zones, including measuring techniques and instruments.	L2
CO2	Analyse vibratory systems, single-degree-of-freedom (SDOF) models, damping effects, and earthquake-induced dynamic forces.	L4
CO3	Evaluate conceptual design strategies, ductility factors, and seismic design methods for ensuring structural resilience.	L5
CO4	Apply IS code provisions and lateral force methods for seismic design of reinforced concrete and masonry buildings.	L3
CO5	Assess the significance of structural walls, non-structural elements, and ductile detailing in enhancing earthquake resistance.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	1	-	3	1	-	2	-	2	2	2
CO2	3	-	-	-	2	-	3	1	-	2	-	-	-	2
CO3	3	-	-	3	-	-	3	2	-	2	-	-	-	3
CO4	3	2	-	3	-	-	3	2	-	2	2	2	3	3
CO5	3	3	-	3	-	-	3	2	-	2	2	2	3	3



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B.Tech. III Year II Semester

OPEN CHANNEL FLOW

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0129T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE - II

Course Objectives:

The objectives of this course are to make the student to:

1. Explain the principles governing fluid flow in pipelines and networks, including steady and unsteady flow conditions.
2. Apply fundamental concepts of uniform and varied flow in open channels for analyzing hydraulic structures and networks.
3. Analyse the behavior of unsteady flows in open channels, including wave motion and dam break scenarios.
4. Evaluate sediment transport mechanisms and their impact on hydraulic structures, reservoirs, and river morphology.
5. Design and assess hydraulic models, flow measurement devices, and physical models for hydraulic applications.

Syllabus		Total Hours: 48
Unit-I	Hydraulics of Pipelines And Pipe Networks	8Hrs
Review of Fluid Mechanics. Reynolds Transport Theorem and Applications. Steady Flow Analysis of Pipe Network Systems. Unsteady Flows - Basic Equations of Water Hammer, Solution By Method of Characteristics. Network Analysis		
Unit-II	Steady Varied Flows In Open Channels	10Hrs
Basic Concepts of Uniform Flow. Specific Energy and Specific force Concepts. Dynamic Equation for Spatially Varied Flows. Flow Profile Computations. Introduction to Hec-Ras. Spatially Varied Flows and Rapidly Varied Flows – Applications.		
Unit-III	Unsteady Flows In Open Channels	10Hrs
Equations of Motion. Uniformly Progressive Wave. Rapidly Varied Unsteady Flow – Positive and Negative Surges. Dam Break Problem		
Unit-IV	Sediment Transport	10Hrs
Sediment Properties – Inception of Sediment Motion – Bed forms. Bed Load Suspended Load – total Sediment Transport. Design of Stable Channels and Regime Channels. Reservoir Sedimentation and Trap Efficiency.		
Unit-V	Flow Measurements And Hydraulic Modeling	10Hrs
Sharp-Crested Weirs, Broad-Crested Weirs, Critical Depth Flumes. Recent Advancement in Open Channel Flow Measurements. Physical Modeling in Hydraulics. Dimensional Analysis. Modeling Closed Flows and Free Surface Flows. Distorted Models. Design of Physical Models.		
Text Books:		
<ol style="list-style-type: none"> 1. Flow in Open Channels, Subramanya K., Tata McGraw Hill Pub., N Delhi 2015 2. Flow through Open Channels, Rajesh Srivastava, Oxford Univ. Press. N Delhi, 2011 3. Open Channel Hydraulics, Chow, V. T. McGrawHill Inc. NYork, 1979 		
Reference Books:		
<ol style="list-style-type: none"> 1. Open Channel Hydraulics, French, R.H., McGraw Hill PubCo., NYork, 1986 		



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B.Tech. III Year II Semester

FOUNDATION ENGINEERING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0130T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE - II

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the need for soil exploration and various methods used in site investigations.
2. Analyse the stability of slopes under different conditions using various stability methods.
3. Apply earth pressure theories to Analyse retaining walls and soil pressures.
4. Evaluate the bearing capacity and settlement characteristics of shallow foundations.
5. Assess the load-carrying capacity and settlement of deep foundations, including pile and well foundations.

Syllabus		Total Hours: 48
Unit-I	Soil Exploration	8Hrs
Need – Methods of Soil Exploration – Boring and Sampling Methods – Field Tests – Penetration Tests – Plate Load Test – Pressure Meter – Planning of Programme and Preparation of Soil Investigation Report.		
Unit-II	Shallow Foundations	10Hrs
SHALLOW FOUNDATIONS: Types – Choice of Foundation – Location of Depth – Safe Bearing Capacity – Terzaghi's, Meyerhoff's and Skempton's Methods ALLOWABLE BEARING PRESSURE: Safe Bearing Pressure Based On N- Value – Allowable Bearing Pressure; Safe Bearing Capacity and Settlement From Plate Load Test – Allowable Settlements of Structures – Settlement Analysis.		
Unit-III	Pile & Well Foundations	10Hrs
PILE FOUNDATION: Types of Piles – Load Carrying Capacity of Piles Based On Static Pile formulae – Dynamic Pile formulae – Pile Load Tests – Load Carrying Capacity of Pile Groups in Sands and Clays – Settlement of Pile Groups WELL FOUNDATIONS: Types – Different Shapes of Wells – Components of Wells – Functions and Design Criteria – Sinking of Wells – Tilts and Shifts		
Unit-IV	Earth Slope Stability	10Hrs
Infinite and Finite Earth Slopes – Types of Failures – Factor of Safety of Infinite Slopes – Stability Analysis By Swedish Arc Method, Standard Method of Slices, Bishop's Simplified Method – Taylor's Stability Number- Stability of Slopes of Earth Dams Under Different Conditions.		
Unit-V	Earth Pressure Theories	10Hrs
EARTH PRESSURE THEORIES: Rankine's Theory of Earth Pressure – Earth Pressures in Layered Soils – Coulomb's Earth Pressure Theory – Rebhann's and Cullman's Graphical Method RETAINING WALLS: Types of Retaining Walls – Stability of Retaining Walls		

Text Books:

1. Geotechnical Engineering by C.Venkataramaiah, New Age Publications(2002).
2. Soil Mechanics and Foundation Engineering by Arora, Standard Publishers and Distributors, Delhi 7th edition 2009
3. Soil Mechanics and Foundations by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi 17th edition 2017.



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Reference Books:

1. Soil Mechanics and Foundation Engineering by Purushtoma Raj, Pearson Publications 2nd edition 2013
2. Principles of Foundation Engineering by Das, B.M., - (1999)–6th edition (Indian edition) Thomson Engineering
3. Foundation Engineering by Varghese, P.C., Prentice Hall of India., New Delhi.
4. Foundation Engineering by V.N.S.Murthy, CRC Press, New Delhi.

Online Learning Resources:

<https://nptel.ac.in/courses/105105176>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the principles of soil exploration, field testing, and soil investigation reporting.	L2
CO2	Analyse slope stability using different failure theories and numerical methods.	L4
CO3	Apply earth pressure theories to determine the stability of retaining walls.	L3
CO4	Evaluate the bearing capacity and settlement of shallow foundations using theoretical and field methods.	L5
CO5	Analyse deep foundations, including pile and well foundations, for their load-carrying capacity and settlement.	L4

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	1	-	-	-	1	-	1	1	1
CO2	2	2	1	1	2	-	-	-	-	-	-	1	1	1
CO3	2	2	3	2	2	-	1	-	-	-	-	1	2	2
CO4	2	1	2	2	3	1	-	-	-	-	-	1	2	1
CO5	2	2	2	1	2	1	-	-	-	-	-	1	2	1



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B.Tech. III Year II Semester

COST EFFECTIVE HOUSING TECHNIQUES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0131T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE - III

Course Objectives:

The objectives of this course are to make the student to:

1. Analyse the housing scenario in urban and rural areas, including challenges in housing finance and urban planning.
2. Explore and evaluate innovative low-cost housing technologies for sustainable construction.
3. Investigate alternative building materials and infrastructure services for cost-effective housing solutions.
4. Assess rural housing techniques, including traditional mud housing, soil stabilization, and fire treatment for roofing.
5. Develop strategies for housing in disaster-prone areas, with a focus on earthquake, cyclone, and flood-resistant construction.

Syllabus	Total Hours: 48
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Unit-I	Introduction To Housing conditions	10Hrs
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- a) **Housing Scenario:** Introducing - Status of Urban Housing - Status of Rural Housing
- b) **Housing Finance:** Introducing - Existing Finance System in India - Government Role as Facilitator - Status At Rural Housing Finance – Impedimently In Housing Finance and Related Issues
- c) **Land Use and Physical Planning for Housing :** Introduction - Planning of Urban Land - Urban Land Ceiling and Regulation Act - Efficiency of Building Bye Lass - Residential Densities
- d) **Housing The Urban Poor:** Introduction - Living Conditions in Slums - Approaches and Strategies for Housing Urban Poor.

Unit-II	Development And Adoption Of Low Cost Resilient Housing Technology	10Hrs
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Introduction - Adoption of Innovative Cost Effective Construction Techniques - Adoption of Precast Elements in Partial Prefabrication- Adopting of total Prefabrication of Mass Housing in India- General Remarks On Pre Cast Roofing/Flooring Systems -Economical Wall System - Single Brick Thick Loading Bearing Wall - 19cm Thick Load Bearing Masonry Walls - Half Brick Thick Load Bearing Wall – Fly-Ash Gypsum Thick for Masonry - Stone Block Masonry - Adoption of Precast R.C. Plank and Join System for Roof/Floor in The Building

Unit-III	Alternative Building Materials for Low Cost Housing	10Hrs
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Alternative Building Materials for Low Cost Housing Introduction - Substitute for Scarce Materials – Ferro-Cement - Gypsum Boards - Timber Substitutions - Industrial Wastes - Agricultural Wastes - Alternative Building Maintenance Low Cost Infrastructure Services: Introduction - Present Status - Technological Options - Low Cost Sanitation - Domestic Wall - Water Supply, Energy

Unit-IV	Rural Housing	8Hrs
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Introduction Traditional Practice of Rural Housing Continuous - Mud Housing Technology Mud Roofs - Characteristics of Mud - Fire Treatment for Thatch Roof - Soil Stabilization - Rural Housing Program

Unit-V	Housing In Disaster Prone Areas	10Hrs
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Introduction – Earthquake - Damages to Houses - Traditional Prone Areas - Type of Damages and Railways of Non-Engineered Buildings - Repair and Restore Action of Earthquake Damaged Non-Engineered Buildings Recommendations for Future Constructions. Requirements Of Structural Safety of Thin Precast Roofing Units Against Earthquake forces Status of R&D in Earthquake Strengthening Measures - Floods, Cyclone, Future



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Safety

Text Books:

1. Building materials for low – income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Low cost Housing – G.C. Mathur by South Asia Books

Reference Books:

1. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.
2. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.
3. Modern trends in housing in developing countries – A.G. MadhavaRao, D.S. Rama chandra Murthy & G. Annamalai. E. & F. N. Spon Publishers

Online Learning Resources:

<https://nptel.ac.in/courses/124107001>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Examine the current status of urban and rural housing and Analyse the role of finance and planning in housing development.	L3
CO2	Evaluate and recommend cost-effective construction techniques, including prefabrication and innovative roofing/flooring systems.	L5
CO3	Assess the feasibility of alternative building materials and infrastructure solutions for low-cost housing.	L5
CO4	Analyse traditional rural housing methods and propose modern techniques for improving rural housing quality.	L4
CO5	Design housing solutions for disaster-prone areas by incorporating earthquake, cyclone, and flood-resistant strategies.	L6

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	-	2	2	-	-	1	-	1	2	2
CO2	3	3	2	3	2	-	3	-	-	-	-	2	3	2
CO3	3	2	3	3	2	-	3	-	-	-	-	2	3	3
CO4	2	3	3	3	2	2	2	-	-	-	-	2	3	3
CO5	2	3	3	3	3	3	3	-	-	-	-	2	3	3



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B.Tech. III Year II Semester

WATERSHED MANAGEMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0132T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE - III

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the concept of watershed management, stakeholder roles, pollution sources, and environmental guidelines for water quality.
2. Analyse soil erosion processes, sediment yield, and wetland hydrology, including the role of water in wetland ecosystems.
3. Evaluate surface water and groundwater interactions, wetland water quality, and hydrological models for effective watershed planning.
4. Apply principles of wetland hydrologic assessment, water harvesting, and watershed treatment system design to real-world scenarios.
5. Assess irrigation planning, participatory water management, and water footprint concepts to ensure sustainable water resource utilization.

Syllabus	Total Hours: 48
Unit-I Introduction to Watershed Management Concept of Watershed, Introduction to Watershed Management, Different Stakeholders and Their Relative Importance, Watershed Management Policies and Decision Making, Watershed Management Practices in Arid and Semiarid Regions, Short Term and Long Term Strategic Planning, Types and Sources of Pollution, Environmental Guidelines for Water Quality, Perspective On Recycle and Reuse	8Hrs
Unit-II Morphometry, Soil Erosion Erosion - Factors Affecting Erosion, Effects of Erosion On Land Fertility and Land Capability, Soil Erosion Modelling, Erosivity and Erodibility - Sediment Yield and Sedimentation- Wetland Definitions and The Role of Water in Wetland Structure and Function, Introduction to Wetland Water Budgets and Hydro-Period Components of The Water Budget: Inflows, Outflows, and Storage, Precipitation and Runoff, Evapotranspiration;	10Hrs
Unit-III Surface Water Flows Structures and Channels, Groundwater-Surface Water Exchange in Wetlands, Surface Water Flows Ii and Wetland Hydrology Case Studies, Flow and Mixing in Wetlands Wetland Water Quality Information: Nutrients, Organic/Inorganic Contaminants, Sediments and Colloids, Wetland Transport Models I: Plug Flow, Cisterns and Cisterns in Series; Intro to Method of Moments.	10Hrs
Unit-IV Wetland Hydrologic Assessment Physical and Biological Processes, Anthropogenic and Climate Change Impacts On Wetland Hydrology, Modeling Wetland Hydrology, Hydraulics, and Hydrodynamics, Introduction to Wetland Treatment Systems Design - Water Harvesting: Rainwater Harvesting, Catchment Harvesting, Harvesting Structures - Model Watershed – Government and Ngo Projects.	10Hrs
Unit-V Rain Water Management Planning and Operation of Irrigation Systems. Conjunctive Use of Water. Participatory Irrigation Management and Integrated Water Resources Management (IWRM), Water Management Policy During Droughts. Predicting Effect of Water Shortage on Crops. Introduction to Water Footprint of Crops and Its Applications. Blue, Green and Grey Water Foot Print.	10Hrs



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Text Books:

1. T. O. Randhir, Watershed Management: Issues and Approaches, IWA Publishing, 2006
2. J. V. S. Murty, Watershed Management, New Age International, 2013

Reference Books:

1. D. K. Majumdar, Irrigation Water Management, Prentice Hall, 2014
2. K. N. Brooks, P. F. Folliott, J. A. Magner, Hydrology and the Management of Watersheds, Wiley-Blackwell, Fourth edition, 2012
3. E. M. Tideman, Watershed Management: Guidelines for Indian Conditions, Omega Scientific Publishers, 1996
4. R. Rajora, Integrated Watershed Management: Field Manual for Equitable, Productive and Sustainable Development, Rawat Publications, 2019

Online Learning Resources:

<https://nptel.ac.in/courses/105101010>

<https://nptel.ac.in/courses/126105334>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain watershed management concepts, pollution control strategies, and environmental policies related to water quality.	L2
CO2	Analyse erosion processes, wetland water budgets, and sediment transport models to assess land degradation and conservation needs.	L4
CO3	Evaluate surface and groundwater interactions, wetland treatment efficiency, and hydrological models for integrated water resource management.	L5
CO4	Apply water harvesting techniques, hydrologic modeling, and wetland design methods for sustainable watershed management.	L3
CO5	Assess irrigation water management strategies, drought mitigation policies, and the role of water foot print in agricultural sustainability.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	2	3	1	-	2	-	2	2	2
CO2	3	3	2	3	2	2	3	1	-	2	-	2	2	2
CO3	3	3	3	3	3	2	3	2	-	2	-	2	3	3
CO4	3	2	3	3	3	3	3	2	-	2	2	2	3	3
CO5	3	3	3	3	3	3	3	2	-	2	2	2	3	3



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B.Tech. III Year II Semester

ADVANCED STRUCTURAL ANALYSIS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0133T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE - III

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental concepts of arches, including three-hinged and two-hinged arches, and Analyse the effects of horizontal thrust, bending moment, normal thrust, and radial shear.
2. Apply the moment distribution method to Analyse single-bay, single-story portal frames with and without side sway.
3. Analyse continuous beams and portal frames using Kani's Method, including cases with and without settlement of supports.
4. Solve structural problems using the flexibility method for continuous beams and single-bay portal frames, considering support settlements and side sway effects.
5. Evaluate the stiffness method for analyzing continuous beams and single-bay portal frames with and without side sway, ensuring structural stability and performance.

Syllabus	Total Hours: 48
Unit-I	Arches 10Hrs
Three Hinged and Two Hinged Arches, Elastic Theory of Arches– Eddy's Theorem –Determination of Horizontal Thrust, Bending Moment, Normal Thrust and Radial Shear–Effect of Temperature–Determination of Horizontal Thrust Bending Moment, Normal Thrust and Radial Shear–Rib Shortening and Temperature Stresses.	
Unit-II	Moment Distribution Method For Frames 8Hrs
Analysis of Single Bay Single Storey Portal Frame Including Sides Way–Substitute Frame Analysis By Two Cycle Method.	
Unit-III	Kani'S Method 10Hrs
Analysis of Continuous Beams With and Without Settlement of Supports-Single Bay Single Storey Portal Frames With and Without Side Sway.	
Unit-IV	Flexibility Method 10Hrs
Flexibility Methods- Introduction-Application to Continuous Beams Including Support Settlements—Analysis of Single Bay Single Storey Portal Frames Without and With Side Sway.	
Unit-V	Stiffness Method 10Hrs
Stiffness Methods – Introduction – Application to Continuous Beams Including Support Settlements – Analysis of Single Bay Single Storey Portal Frames Without and With Side Sway.	

Text Books:

1. Analysis of structures by Vazrani &0020Ratwani– Khanna Publications.
2. Theory of structures by Ramamuratham, jain book depot , New Delhi.

Reference Books:

1. Structural analysis by R.S. Khurmi, S.Chand Publications, New Delhi.
2. Basic Structural Analysis by K.U. Muthuetal., I.K. International Publishing HousePvt.Ltd
3. Theory of Structures by Gupta SP, GS Pundit and R Gupta, Vol II, Tata McGraw Hill Publications Company td.



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4. D. S. Prakash Rao, Structural Analysis: A Unified Approach, Universities Press

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/106/105106050/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the behaviour of three-hinged and two-hinged arches and Analyse the effects of horizontal thrust, bending moment, normal thrust, and radial shear.	L2
CO2	Apply the moment distribution method to Analyse single-bay, single-story portal frames with and without side sway.	L3
CO3	Analyse continuous beams and portal frames using Kani's Method, including cases with and without settlement of supports.	L4
CO4	Solve structural problems using the flexibility method for continuous beams and single-bay portal frames, considering support settlements and side sway effects.	L3
CO5	Evaluate the stiffness method for analyzing continuous beams and single-bay portal frames with and without side sway, ensuring structural stability and performance.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	-	-	-	-	2	-	1	2	2
CO2	3	3	2	2	2	-	-	-	-	2	-	2	2	2
CO3	3	3	3	2	2	-	-	-	-	2	-	2	3	2
CO4	3	2	3	3	3	-	-	-	-	2	1	2	3	3
CO5	3	3	3	3	3	-	-	-	-	2	1	2	3	3



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B.Tech. III Year II Semester

HIGHWAY ENGINEERINGLAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0134P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the properties and behavior of aggregates and bitumen used in highway construction.
2. Perform standard laboratory tests on aggregates and bitumen to evaluate their suitability for road construction.
3. Analyse the strength, durability, and performance characteristics of pavement materials.
4. Assess the quality and compliance of highway materials with standard specifications.
5. Develop hands-on skills for material testing and interpretation of test results.

Syllabus

Total Hours:48

List Of Experiments :

I. TEST ON AGGREGATES

1. Specific Gravity Determination of the Coarse Aggregate Sample
2. Determination of Abrasion Value of the Coarse Aggregate Sample.
3. Determination of Impact Value of Coarse Aggregate
4. Determination of Elongation Index of Coarse Aggregate
5. Determination of Flakiness Index of Coarse Aggregate
6. Determination of Aggregate Crushing Value of Coarse Aggregate
7. Determination of Water Absorption Capacity of the Coarse Aggregate Sample.

II. TEST ON BITUMEN

1. Specific Gravity Determination of The Bitumen/Asphalt Sample.
2. Penetration Test on Bitumen.
3. Viscosity Determination of Bituminous Binder .
4. Determination of Softening Point of The Asphalt/Bitumen Sample
5. Determination of Ductility Value of The Bitumen Sample
6. Estimation of Loss of Bitumen On Heating
7. Bitumen Extraction Test

Text Books:

1. Highway Material Testing Manual, Khanna, Justo and Veera Raghavan, Nem chand Brothers

Reference Books:

1. IS 383 :1993 —Specification for Coarse and Fine Aggregates From Natural Sources for Concrete
2. IS 1201 -1220 (1978) —Methods for testing tars and bituminous materials
3. IRC SP 53 -2010 —Guidelines on use of modified bitumen
4. MS-2 Manual for Marshalls Mix design 2002

E-Resources

<https://ts-nitk.vlabs.ac.in/>

Course Outcomes:

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

Cos	Statements	Blooms level
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CO1	Determine the physical properties of coarse aggregates, such as specific gravity, water absorption, and shape characteristics.	L3
CO2	Evaluate the mechanical properties of aggregates, including abrasion resistance, impact strength, and crushing value.	L5
CO3	Analyse the physical and chemical properties of bituminous materials through standard tests.	L4
CO4	Perform Marshall stability tests and assess the optimum binder content for bituminous mixes.	L3
CO5	Interpret test results to assess the suitability of aggregates and bitumen for pavement construction.	L2

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	3	3	1	-	1	-	2	3	3
CO2	3	3	3	2	2	2	2	1	-	-	-	1	3	3
CO3	3	3	3	2	2	2	3	1	-	-	-	1	3	3
CO4	3	3	3	2	2	2	3	1	-	-	-	1	3	3
CO5	3	2	2	1	3	3	3	1	-	1	1	2	2	2



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B.Tech. III Year II Semester

ENVIRONMENTAL ENGINEERING LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0135P	0:0:3:0	1.5	CIE:30 SEE:70	3Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the principles and methods of water and wastewater sampling and preservation.
2. Perform standard laboratory tests to determine water quality parameters.
3. Analyse wastewater characteristics and assess pollution levels.
4. Evaluate the effectiveness of treatment processes using chemical and biological tests.
5. Develop hands-on skills in advanced laboratory techniques for environmental monitoring.

Syllabus

Total Hours:48

List Of Experiments :

- i. ANALYSIS of WATER SAMPLE
 - 1) Sampling and preservation methods for water and wastewater (Demonstration only)
 - 2) Measurement of Electrical conductivity and turbidity
 - 3) Determination of fluoride in water by spectrophotometric method /ISE
 - 4) Determination of iron in water (Demo)
 - 5) Determination of Sulphate in water
 - 6) Determination of Optimum Coagulant Dosage by Jar test apparatus
 - 7) Determination of available Chlorine in Bleaching powder and residual chlorine in water
- ii. ANALYSIS of WASTEWATER SAMPLE
 - 1) Estimation of suspended, volatile and fixed solids
 - 2) Determination of Sludge Volume Index in waste water
 - 3) Determination of Dissolved Oxygen
 - 4) Estimation of B.O.D.
 - 5) Estimation of C.O.D.
 - 6) Determination of TKN and Ammonia Nitrogen in wastewater
 - 7) Determination of total and faecal coliform (Demonstration only)

Note: Minimum 10 out of the above experiments are to be carried out.

Text Books:

1. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
2. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

Reference Books:

1. Environmental Engineering Laboratory Manual by Dr. S.K. Panigrahi, L. Mohanty, S.K. Kataria & Sons

E-Resources

<https://ee1-nitk.vlabs.ac.in/>

<https://ee2-nitk.vlabs.ac.in/>

Course Outcomes:

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



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Cos	Statements	Blooms level
CO1	Apply appropriate sampling and preservation techniques for water and wastewater.	L3
CO2	Measure physical and chemical parameters such as turbidity, conductivity, and chlorine content.	L5
CO3	Analyse key water and wastewater quality indicators like BOD, COD, and TKN.	L4
CO4	Assess the efficiency of water treatment processes through laboratory tests.	L5
CO5	Perform microbiological analysis for coli form detection and sludge characterization.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	-	2	2	-	-	-	1	1	1	1
CO2	2	2	1	-	-	1	1	-	-	-	1	1	2	2
CO3	2	1	2	-	1	1	2	-	-	-	2	1	1	1
CO4	1	1	1	1	-	1	1	-	-	-	1	1	2	2
CO5	2	1	2	-	-	1	2	1	-	-	1	1	1	1



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B.Tech. III Year II Semester

BUILDING INFORMATION MODELING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0136P	0:1:2:0	2	CIE:30 SEE:70	3Hours	SEC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamentals of Building Information Modeling (BIM) and Autodesk Revit.
2. Develop proficiency in Revit's basic drawing and editing tools for structural and architectural modeling.
3. Create 3D models of buildings, including walls, floors, ceilings, roofs, stairs, and railings.
4. Analyse different components such as curtain walls, doors, windows, and structural elements.
5. Apply various visualization and detailing techniques to generate callouts, elevations, and sections.

Syllabus

Total Hours:48

List Of Experiments :

- 1) INTRODUCTION to BIM & AUTODESK REVIT - About Auto desk and Autocad, Workflow and BIM, Revit Terms, Overview of The Interface, Starting Projects, Viewing Commands.
- 2) BASIC DRAWING and EDITING to OLS - Using General Drawing tools, Editing Elements, Working with Modification tools.
- 3) SETTING UP LEVELS and GRIDS - Setting up Levels and Grids, Creating Structural Grids, Adding Columns, Linking and Importing CAD files.
- 4) MODELING WALLS Modelling Walls, Modifying Walls, Model Exterior Shell, Add Interior Walls.
- 5) WORKING WITH DOORS and WINDOWS Inserting Doors and Windows, Loading Door and Window Types from Library, Creating Additional Door and Window Sizes.
- 6) WORKING WITH CURTAIN WALLS Creating Curtain Walls, Adding Curtain Grids, Working With Curtain Wall Panels, Attaching Mullions to Curtain Grids.
- 7) WORKING WITH VIEWS Setting the View Display, Duplicating Views, Adding Callout Views, Elevations and Sections.
- 8) ADDING COMPONENTS Adding Component, Modifying Component, Working With Elements.
- 9) MODELING FLOORS Modelling & Modifying Floors, Joining Geometry, Creating Shaft Openings, Creating Sloped Floors
- 10) MODELING CEILINGS & ROOFS Modelling Ceilings, Adding Ceiling Fixtures, Creating Ceiling Soffits, Modelling Roofs
- 11) MODELING STAIRS and RAILING Creating Component Stairs, Modifying Component Stairs, Working With Railings, Sketching Custom Stairs, Creating Ramps.

Text Books:

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston —BIM HANDBOOK, Wiley, 2nd Edition, 2011
2. Wing, Eric. Autodesk Revit Architecture 2017: No Experience Required. Indianapolis: John Wiley & Sons, 2016

Reference Books:

1. Kim, Marcus, Lance Kirby, and Eddy Krygiel. Mastering Autodesk Revit 2017 for architecture. 1st ed.



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INpolis, IN: John Wiley & Sons, 2016.

- Garber, Richard. BIM Design: Realizing the Creative Potential of Building Information Modeling. AD Smart 02. Chichester, U.K.: Wiley, 2004
- Peter B. and Nigel D., —BIM in Principle and in Practice, 1 st Edition, ICE Publishing, 2014.
- BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors,
- Chuck Eastman, Paul Teicholz, Rafael Sacks and Kathleen Liston, John Wiley & Sons, 2008.
- BIM and Construction Management: Proven tools, Methods, and Workflows, Brad Hardin, Sybex, 2009.
- Building Information Modeling: BIM in Current and Future Practice, Karen Kensek and Douglas Noble, Wiley, 2014, First Edition.

E-Resources

<https://minnodillc.com/building-information-modeling-bim/>

<https://www.skyfilabs.com/online-courses/building-information-modelling-course>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the fundamentals of BIM and Autodesk Revit's interface and workflow.	L2
CO2	Use basic drawing, editing, and modification tools in Revit for creating and modifying models.	L3
CO3	Model various architectural elements such as walls, doors, windows, floors, ceilings, and roofs.	L3
CO4	Construct structural elements including grids, columns, stairs, railings, and ramps.	L6
CO5	Generate 3D views, sections, and elevations for visualization and detailing purposes.	L6

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	3	1	-	-	-	1	-	2	3	3
CO2	3	3	3	3	3	2	-	-	-	-	-	2	3	3
CO3	3	3	3	3	3	3	1	-	-	-	-	2	3	3
CO4	3	3	3	3	3	3	1	-	-	-	-	2	3	3
CO5	2	2	2	2	3	3	1	-	-	1	1	2	2	2



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B.Tech. III Year II Semester

TECHNICAL PAPER WRITING AND INTELLECTUAL PROPER RIGHTS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
	2:0:0:0	0	CIE:30 SEE:0	-	MC

Course Objectives:

The objectives of this course are to make the student to:

1. To enable the students to practice the basic skills of research paper writing
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review
4. To help them in knowing the significance of real life practice and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

Syllabus		Total Hours: 48
Unit-I	Principles of Technical Writing	8Hrs
styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity-repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing .		
Unit-II	Technical Research Paper Writing	10Hrs
Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis		
Unit-III	Process of research	10Hrs
publication mechanism: types of journals- indexing-seminars- conferences- proof reading –plagiarism style; seminar & conference paper writing; Methodology-discussion-results- citation rules		
Unit-IV	Introduction to Intellectual property & Trade marks	10Hrs
Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.		
Unit-V	Law of copy rights & Patents	10Hrs
Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.		
Text Books:		
<ol style="list-style-type: none"> 1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013 2. Meenakshi Raman, Sangeeta Sharma. Technical Communication: Principles and practices. Oxford. 		
Reference Books:		
<ol style="list-style-type: none"> 1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019. 2. Prabuddha Ganguli, Intellectual Property Rights Tata Mcgraw Hill, 2001 3. P.Naryan, Intellectual Property Law, 3rd Ed ,Eastern Law House, 2007. 4. Adrian Wallwork. English for Writing Research Papers Second Edition. Springer Cham Heidelberg 		



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New York ,2016

5. 5. Dan Jones, Sam Dragga, Technical Writing Style

Online Learning Resources:

1. <https://theconceptwriters.com.pk/principles-of-technical-writing/>
2. <https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html>
3. <https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html>
4. <https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/>
5. <https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf>
6. <https://lawbhoomi.com/intellectual-property-rights-notes/>
7. <https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Identify key secondary literature related to their proposed technical paper writing	L1, L2
CO2	Explain various principles and styles in technical writing	L1, L2
CO3	Use the acquired knowledge in writing a research/technical paper	L3
CO4	Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.	L4
CO5	Evaluate different forms of IPR available at national & international level	L5
CO6	Develop skill of making search of various forms of IPR by using modern tools and techniques.	L3, L6



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B.Tech. III Year II Semester

RENEWABLE ENERGY SOURCES (All Branches Except EEE)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0232T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-II

Course Objectives:

The objectives of the course are to make the students learn about:

Syllabus	Total Hours:
Unit-I	10Hrs
Solar Energy	
Solar radiation – beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. Flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.	
Unit-II	9Hrs
PV Energy Systems	
Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.	
Unit -III	10Hrs
Wind Energy	
Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.	
Unit -IV	10Hrs
Geothermal Energy	
Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geopressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India	
Unit -V	9Hrs
Miscellaneous Energy Technologies	
Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations. Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration.	
Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.	

Course Outcomes(CO):

After the completion of the course students will able to:

CO 1: Understand principle operation of various renewable energy sources. L1

CO 2: Identify site selection of various renewable energy sources. L2

CO 3: Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomass, Tidal Wave and Fuel cell energies L3

CO 4: Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems. L5 CO 5: Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power. L4

Textbooks:

1.G. D. Rai, —Non-Conventional Energy Sources, 4th Edition, Khanna Publishers, 2000.

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2.Chetan Singh Solanki —Solar Photovoltaics fundamentals, technologies and applications| 2nd Edition PHI Learning Private Limited. 2012

Reference Books:

- 1.Stephen Peake, —Renewable Energy Power for a Sustainable Future|, Oxford International Edition, 2018.
- 2.S. P. Sukhatme, —Solar Energy|,3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
- 3.B H Khan , — Non-Conventional Energy Resources|, 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
- 4.S. Hasan Saeed and D.K.Sharma,—Non-Conventional Energy Resources|,3rd Edition, S.K.Kataria& Sons, 2012.
5. G. N. Tiwari and M.K.Ghosal, —Renewable Energy Resource: Basic Principles and Applications|, Narosa Publishing House, 2004.

Online Learning Resources:

1. <https://nptel.ac.in/courses/103103206>
2. <https://nptel.ac.in/courses/108108078>



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B.Tech. III Year II Semester

Automation and Robotics

CSE, CSE-AIML, CSE-CS, CSE-DS, CE, ECE, EEE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0328T	3: 0: 0: 0	3	CIE:30 SEE:70	3 Hours	OE-II

Course Objectives:

- Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.
- Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation.
- Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.
- Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.
- Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

Syllabus		Total Hours:48
Unit – I	Introduction to Automation	8 Hrs
Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.		
Unit – II	Automated flow lines	10Hrs
Automated flow lines: Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines		
Unit – III	Introduction to Industrial Robotics	10 Hrs
Introduction to Industrial Robotics : Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers. Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors		
Unit - IV	Manipulator Kinematics & Manipulator Dynamics	10 Hrs
Manipulator Kinematics: Manipulator Kinematics, Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics. Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.		
Unit - V	Robot Programming & Robot Application in Manufacturing	10 Hrs
Robot Programming: Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages. Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection		

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**Course Outcomes(CO):****On completion of this course, student will be able to**

- Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.
- Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.
- Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.
- Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.
- Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks

Text Books:

1. M.P.Groover, Automation, Production systems and CIM, Pearson Edu, 2015.
2. M.P.Groover, Industrial Robotics, TMH, 2012

Reference Books:

1. FuKS, Robotics, McGrawHill,4thedition,2010.
2. P.Coiffet and M.Chaironze, An Introduction to Robot Technology, Kogam PageLtd. 1983 London.
3. Richard D.Klafter, Robotic Engineering, Prentice Hall, 1989.
4. Ashitave Ghosal, Robotics, Fundamental Concepts and analysis, OxfordPress,1/e,2006
5. Mittal RK & Nagrath, Robotics and Control, TMH,2003.



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B.Tech. III Year II Semester

DIGITAL ELECTRONICS

(Common To All Branches Except ECE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0443T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-II

Course Objectives:

- To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
- To analyze combinational circuits like adders, subtractors, and code converters.
- To explore combinational logic circuits and their applications in digital design.
- To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
- To gain knowledge about programmable logic devices and digital IC's.

Syllabus	Total Hours: 45
Unit-I	9 Hrs
Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.	
Unit-II	9 Hrs
Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Binary Multipliers, Code converters- Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.	
Unit -III	9 Hrs
Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.	
Unit -IV	9 Hrs
Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.	
Unit -V	9 Hrs
Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL). Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).	
Textbooks:	
1. Digital Design, M. Morris Mano & Michel D. Ciletti, 5 th Edition, Pearson Education, 1999. 2. Switching theory and Finite Automata Theory, Zvi Kohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.	
Reference Books:	
1. Fundamentals of Logic Design, Charles H Roth, Jr., 5 th Edition, Brooks/cole Cengage Learning, 2004.	

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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.

**Course Outcomes(CO):****On completion of this course, student will be able to:****CO1:** Understand the Boolean algebra, logic simplification techniques**CO2:** Implement the minimization techniques for combinational circuit design**CO3:** Analyze the combinational circuits like adders, subtractors, multipliers and code converters**CO4:** Explore the combinational logic circuits and their applications in digital design**CO5:** Understand the sequential logic circuits, including latches, flip-flops, counters, and shift registers**CO6:** Understand the programmable logic devices and digital IC's



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B.Tech. III Year II Semester

FUNDAMENTALS OF OPERATING SYSTEMS

(Common to all branches except CSE aligned)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0548T	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	OE-II

Course Objectives:

This course will enable students:

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions

Course Outcomes (CO):

On completion of this course, student will be able to:

- Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
- Under stand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.
- Analyze the memory management and its allocation policies.
- Able to design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms,

Syllabus		Total Hours:48
Module-I	Operating Systems Overview, System Structures	10Hrs
Computing environments, Open-Source Operating Systems System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.		
Module-II	Process Concept, Multithreaded Programming, Process Scheduling, Inter-process Communication	9Hrs
Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.		
Module-III	Memory-Management Strategies, Virtual Memory Management	10Hrs
Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples. Virtual Memory Management: Introduction, Demand paging, Copy on-write, 132 B.Tech - CSE R23 Regulation Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.		
Module-IV	Deadlocks, File Systems	9Hrs



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Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention. File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation

Module-V

System Protection, System Security

10Hrs

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
- Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter process Communication and File systems.)

Reference Books:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhare D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

Web References:

- <https://nptel.ac.in/courses/106/106/106106144/>
- <http://peterindia.net/OperatingSystems.html>



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B.Tech. III Year II Semester

MACHINE LEARNING (Common to all branches except CSE aligned)					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0529T	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	OE-II
Course Objectives:					
The course is introduced for students to					
<ul style="list-style-type: none"> Define machine learning and its different types (supervised and unsupervised) and understand their applications. Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN). Implement unsupervised learning techniques, such as K-means clustering 					
Course Outcomes (CO):					
On completion of this course, student will be able to:					
<ul style="list-style-type: none"> CO1: Identify machine learning techniques suitable for a given problem. Solve real-world problems using various machine learning techniques. Apply Dimensionality reduction techniques for data preprocessing. Explain what is learning and why it is essential in the design of intelligent machines Evaluate Advanced learning models for language, vision, speech, decision making etc 					
Syllabus					Total Hours:48
Module-I					10Hrs
Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.					
Module-II					9Hrs
Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non- Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.					
Module-III					10Hrs
Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias-Variance Trade-off, Random Forests for Classification and Regression. The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification Class Conditional Independence and I Bayes Classifier (NBC)					
Module-IV					9Hrs
Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.					
Module-V					10Hrs

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Clustering : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering

Text Books:

1. Machine Learning Theory and Practicell, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. Machine Learningl, Tom M. Mitchell, McGraw-Hill Publication, 2017
2. Machine Learning in Actionl, Peter Harrington, DreamTech
3. Introduction to Data Miningl, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019

Web Reference:

1. https://onlinecourses.nptel.ac.in/noc20_cs29/preview
2. <https://nptel.ac.in/courses/106106139>



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B.Tech. III Year II Semester

Optimization Techniques (Common to all branches)					
Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0030T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-II
Course Objectives:					
The objectives of the course are to make the students learn about:					
<ul style="list-style-type: none"> Define machine learning and its different types (supervised and unsupervised) and understand their applications. Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN). Implement unsupervised learning techniques, such as K-means clustering 					
Syllabus					Total Hours: 48Hrs
Unit-I	Linear programming I				10Hrs
Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method					
Unit-II	Linear programming II: Duality in Linear Programming				9Hrs
Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem					
Unit -III	Non-linear programming: Unconstrained optimization techniques				10Hrs
Introduction: Classification of Unconstrained minimization methods, Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method					
Unit -IV	Non-linear programming: Constrained optimization techniques				10Hrs
Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.					
Unit -V	Geometric Programming				9Hrs
Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality. Constrained minimization Problems: Solution of a constrained geometric programming problem, primal dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.					
Course Outcomes(CO):					
After the completion of the course students will able to:					
<ul style="list-style-type: none"> Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry. Interpret the transportation models' solutions and infer solutions to the real-world problems. Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications. Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives. 					

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**Textbooks:**

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

Reference Books:

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

Web Reference:

1. https://onlinecourses.nptel.ac.in/noc24_ee122/preview
2. <https://archive.nptel.ac.in/courses/111/105/111105039/>
3. https://onlinecourses.nptel.ac.in/noc21_ce60/preview



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B.Tech. III Year II Semester

Mathematical Foundation of Quantum Technologies (EEE,ME,ECE,CSE,AIIML,DS,CS)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0029T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-II

Course Objectives:

The objectives of the course are to make the students learn about:

- To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.
- To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.
- To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.
- To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.
- To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.

Syllabus		Total Hours: 48Hrs
Unit-I	Linear Algebra Foundation for Quantum Mechanics	10Hrs
Vector spaces definition and examples (\mathbb{R}^2 , \mathbb{R}^3 , function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($ \psi\rangle$, $\langle\phi $, $\langle\phi \psi\rangle$), Change of basis (transformations, unitary matrices).		
Unit-II	From Finite to Infinite Dimensions	9Hrs
Function spaces (L^2 space, square-integrable functions), Inner products for functions ($\int \psi^* \phi dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx , multiplication by x).		
Unit-III	Quantum Mechanical Formalism	10Hrs
Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).		
Unit -IV	Applications and Statistical Interpretation	10Hrs
Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).		
Unit -V	Advanced Topics	9Hrs
Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).		

Course Outcomes(CO):

After the completion of the course students will able to:

- Understand vector spaces, inner products, and linear operators with applications to quantum systems.
- Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.
- Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.
- Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate

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statistical interpretations.

- Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.

Textbooks:

1. David J. Griffiths, Darrell F. Schroeter, Introduction to Quantum Mechanics, 3rd Edition, Cambridge University Press (2018).
2. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

Reference Books:

1. George. F. Simmons, Introduction to Topology and Modern Analysis, MedTech Science Press.
2. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics, Princeton Univ. Press (1996).

Web Reference:

1. <https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf>
2. <https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf>



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B.Tech. III Year II Semester

Physics of Electronic Materials and Devices (Common to all branches of Engineering)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0035T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-II

Course Objectives:

The objectives of the course are to make the students learn about:

- To make the students to understand the concept of crystal growth, defects in crystals and thin films.
- To provide insight into various semiconducting materials and their properties.
- To develop a strong foundation in semiconductor physics and device engineering.
- To elucidate excitonic and luminescent processes in solid-state materials.
- To understand the principles, technologies, and applications of modern display systems.

Syllabus		Total Hours: 48Hrs
Unit-I	Fundamentals of Materials Science	10Hrs
Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).		
Unit-II	Semiconductors	9Hrs
Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electronhole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.		
Unit-III	Physics of Semiconductor Devices	10Hrs
Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.		
Unit -IV	Excitons and Luminescence	10Hrs
Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials. Photoluminescence : General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot. Electro-luminescence : General Principles of electroluminescence, light emitting diode, diode laser.		
Unit -V	Display devices	9Hrs
LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.		

Course Outcomes(CO):

After the completion of the course students will able to:

- Understand crystal growth and thin film preparation
- Summarize the basic concepts of semiconductors
- Illustrate the working of various semiconductor devices
- Analyze various luminescent phenomena and the devices based on these concepts
- Explain the working of different display devices

Textbooks:

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 4th edition, 2021.
2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.

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**Reference Books:**

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005
3. Electronic Components and Materials, Grover and Jamwal, DhanpatRai and Co., New Delhi., 2012.
4. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011

NPTEL course links:

1. <https://nptel.ac.in/courses/113/106/113106062/>
2. https://onlinecourses.nptel.ac.in/noc20_ph24/preview



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B.Tech. III Year II Semester

Chemistry of Polymers and Applications (Common to all branches of Engineering)					
Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0041T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-II
Course Objectives:					
The objectives of the course are to make the students learn about:					
<ul style="list-style-type: none"> To understand the basic principles of polymers To understand natural polymers and their applications. To impart knowledge to the students about synthetic polymers, their preparation and importance. To enumerate the applications of 196hermos196 polymers To enumerate applications of conducting and degradable polymers in engineering 					
Syllabus					Total Hours: 48Hrs
Unit-I	Polymers-Basics and Characterization				10Hrs
Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.					
Unit-II	Natural Polymers & Modified cellulotics				9Hrs
Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins. Modified cellulotics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.					
Unit-III	Synthetic Polymers				10Hrs
Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.					
Unit -IV	Hydrogels of Polymer networks				10Hrs
Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.					
Unit -V	Conducting and Degradable Polymers				9Hrs
Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications. Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.					
Course Outcomes(CO):					
After the completion of the course students will able to:					
<ul style="list-style-type: none"> Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer Describe the physical and chemical properties of natural polymers and Modified cellulotics. Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and 					

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elastomers, Identify the thermosetting and 197hermos polymers.

- Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery,
- Explain classification and mechanism of conducting and degradable polymers.

Textbooks:

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S.Mishra
3. Polymer Chemistry – Gowarikar

Reference Books:

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
2. Advanced Organic Chemistry, B.Miller, Prentice Hall
3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010.



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B.Tech. III Year II Semester

Academic Writing and Public Speaking (Common to All Branches of Engineering)					
Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0045T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-II
Course Objectives:					
The objectives of the course are to make the students learn about:					
<ul style="list-style-type: none"> To encourage all round development of the students by focusing on writing skills To make the students aware of non-verbal skills To develop analytical skills To deliver effective public speeches 					
Syllabus					Total Hours: 48Hrs
Unit-I	Introduction to Academic Writing				10Hrs
Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing					
Unit-II	Academic Journal Article				9Hrs
Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing -Editing, Proof Reading - Plagiarism					
Unit-III	Essay & Writing Reviews				10Hrs
Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP					
Unit -IV	Public Speaking				10Hrs
Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events					
Unit -V	Public Speaking and Non-Verbal Delivery				9Hrs
Body Language – Facial Expressions-Kinesics – Oculistics – Proxemics – Haptics – Chronemics - Paralanguage - Signs					
Course Outcomes(CO):					
After the completion of the course students will able to:					
<ul style="list-style-type: none"> Understand various elements of Academic Writing Identify sources and avoid plagiarism Demonstrate the knowledge in writing a Research paper Analyse different types of essays Assess the speeches of others and know the positive strengths of speakers Build confidence in giving an impactful presentation to the audience 					
Textbooks:					
<ol style="list-style-type: none"> Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010) Pease, Allan & Barbara. The Definitive Book of Body LanguageRHUS Publishers, 2016 					
Reference Books:					



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1. Alice Savage, Masoud Shafiei Effective Academic Writing, 2Ed., 2014 Oxford University Press.
2. Shalini Verma, Body Language, S Chand Publications 2011.
3. Sanjay Kumar and Pushpalata, Communication Skills 2E 2015, Oxford.
4. Sharon Gerson, Steven Gerson, Technical Communication Process and Product, Pearson, New Delhi, 2014
5. Elbow, Peter. Writing with Power. OUP USA, 1998

Online Learning Resources:

1. <https://youtu.be/NNhTIT81nH8>
2. <https://www.youtube.com/watch?v=478ccrWKY-A>
3. <https://www.youtube.com/watch?v=nzGo5ZC1gMw>
4. <https://www.youtube.com/watch?v=Qve0ZBmJMh4>
5. <https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-ofdelivery/>
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
7. <https://archive.nptel.ac.in/courses/109/107/109107172/#>
8. <https://archive.nptel.ac.in/courses/109/104/109104107/>

Member Secretary

Head of the Department,
 Dept. of Civil Engineering
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B.Tech. IV Year I Semester

SL. No	Category	Course Code	Course Name	Hours per week			Total Credits
				L	T	P	
1	PC	23A0137T	Finite Element Methods	3	0	0	3
2	HM	23A0049T 23A0050T 23A0048T	Management Course-II 1.Business Ethics and Corporate Governance 2.E-Business 3.Management Science	2	0	0	2
3	PE	23A0138T 23A0139T 23A0140T	Professional Elective-IV 1.Geo-synthetics and Reinforced Earth Structures 2.Railways, Airports, Docks and Harbour Engineering 3. Experimental Stress Analysis	3	0	0	3
4	PE	23A0141T 23A0142T 23A0143T	Professional Elective-V 1. Ground Improvement Techniques 2. Subsurface Investigation and Instrumentation 3. Transportation Economics	3	0	0	3
5	OE		Open Elective-III	3	0	0	3
6	OE		Open Elective-IV	3	0	0	3
7	SEC	23A0144P	Skills in Civil Engineering software (STAADPRO/CAD/TEKL)	0	1	2	2
8	MC	23A0054T	Gender Sensitization	2	0	0	-
9	PR	(23A0146P)	Evaluation of Industry Internship	-	-	-	2
Total Credits							21

Open Elective-III

SL. No	Course Code	Branch	Course Name
1	23A0241T	EEE	Smart Grid Technologies
2	23A0334T	ME	3D Printing Technologies
3	23A0416T	ECE	Introduction to Microprocessors and Microcontrollers
4	23A0512T	CSE& Allied/IT	Data Base Management Systems
5	23A0532Tb		Cyber Security
6	23A0031T	Mathematics	Wavelet transforms and its Applications
7	23A0036T	Physics	Smart Materials and Devices
9	23A0037T		Introduction to Quantum Mechanics
9	23A0042T	Chemistry	Green Chemistry and Catalysis for Sustainable Environment
10	23A0046T	Humanities	Employability Skills



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Open Elective-IV

SL. No	Course Code	Branch	Course Name
1	23A0242T	EEE	Electric Vehicles
2	23A0335T	ME	Total Quality Management
3	23A0444T	ECE	Transducers and Sensors
4	23A0520T	CSE& Allied/IT	Computer Networks & Internet Protocols
5	23A0450T		Internet of Things
6	23A3315Ta		Introduction to Quantum Computing
7	23A0032T	Mathematics	Financial Mathematics
8	23A0038T	Physics	Sensors and Actuators for Engineering Applications
9	23A0043T	Chemistry	Chemistry of Nanomaterials and Applications
10	23A0047T	Humanities	Literary Vibes

Category	CREDITS
Professional Core Course (PC)	3
Professional Elective Course (PE)	6
Open Elective Course (OE)	6
Skill Enhancement Course (SEC)	2
Management Course (HM)	2
TOTALCREDITS	21

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B.Tech. IV Year I Semester

Finite Element Methods

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0137T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PC

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental principles of the Finite Element Method (FEM) and its applications in structural analysis.
2. Apply the concepts of elasticity, stress-strain relationships, and displacement functions in FEM.
3. Develop finite element formulations for 1D, 2D, and 3D elements.
4. Analyse bar, beam, and plane stress/strain problems using shape functions and stiffness matrices.
5. Implement solution techniques such as numerical integration, static condensation, and element assembly.

Syllabus	Total Hours: 48
Unit-I	10Hrs
Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain Equation – Concept of Plane Stress – Plane Strain Advantages and Disadvantages of FEM. Element Shapes – Nodes – Nodal Degree of Freedom Displacement Function – Natural Coordinates – Strain Displacement Relations.	
Unit-II	10Hrs
Lagrangian– Serendipity Elements – Hermite Polynomials – Regular, Irregular 2 D & 3D – Element – Shape Functions Up to Quadratic formulation. Finite Element Analysis (FEA) of – One Dimensional Problems – Bar Element – Shape Functions Stiffness Matrix – Stress – Strain Relation	
Unit-III	8Hrs
FEA Beam Elements – Stiffness Matrix - Shape Function– Analysis of Continuous Beams.	
Unit-IV	10Hrs
FEA Two-Dimensional Problem – CST – LST Element – Shape Function – Stress – Strain. Iso parametric formulation – Concepts of, Iso parametric Elements for 2D Analysis -Formulation of CST Element.	
Unit-V	10Hrs
Solution Techniques: Numerical Integration, Static Condensation, Assembly of Elements and Solution Techniques for Static Loads.	

Text Books:

1. A first course in Finite Element Method by Daryl L. Logan, 5th Edition, Cengage Learning India Pvt. Ltd.
2. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India

Reference Books:

1. Finite Element Analysis by P. Seshu, PHI Learning Private Limited
2. Concepts and applications of Finite Element Analysis by Robert D. Cook et al., Wiley India Pvt. Ltd.
3. Applied Finite Element Analysis by G. Ramamurty, I.K. International Publishing House Pvt. Ltd.

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/105/105105041/#>
<https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-me43/>



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Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the basic principles, advantages, and limitations of FEM in engineering applications.	L2
CO2	Derive shape functions and stiffness matrices for 1D bar and beam elements.	L3
CO3	Analyse continuous beams and plane stress/strain problems using FEM.	L4
CO4	Develop iso parametric formulation for 2D elements such as CST and LST.	L6
CO5	Implement solution techniques for assembling elements and solving FEM equations.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	3
CO5	2	2	2	2	3	-	-	-	-	-	-	2	2	2



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B.Tech. IV Year I Semester

BUSINESS ETHICS AND CORPORATE GOVERNANCE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0049T	2:0:0:0	2	CIE:30 SEE:70	3 Hours	HM-II

Course Objectives:

The objectives of this course are to make the student to:

1. To make the student understand the principles of business ethics
2. To enable them in knowing about the ethics in management
3. To facilitate the student role in corporate culture
4. To impart knowledge about the fair-trade practices
5. To encourage the student in knowing about the corporate governance

Syllabus	Total Hours: 48
Unit-I	Ethics 8Hrs
Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management -Corporate Social Responsibility – Issues of Management – Crisis Management.	
Unit-II	Ethics In Management 10Hrs
Introduction- Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.	
Unit-III	Corporate Culture 10Hrs
Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.	
Unit-IV	Legal Frame Work 10Hrs
Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.	
Unit-V	Corporate Governance 10Hrs
Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoD's composition, Cadbury Committee - Various committees - Reports - Benefits and Limitations.	

Text Books:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. Bholanath Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

Reference Books:

2. Dr. K. Nirmala, Karunakara Readdy. Business Ethics and Corporate Governance, HPH
3. H.R.Machiraju: Corporate Governance, HPH, 2013
4. K. Venkataramana, Corporate Governance, SHBP.



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5. N.M.Khandelwal. Indian Ethos and Values for Managers

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. <https://archive.nptel.ac.in/courses/110/105/110105138/>
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. <https://archive.nptel.ac.in/courses/109/106/109106117/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand the Ethics and different types of Ethics.	L2
CO2	Understand business ethics and ethical practices in management	L2
CO3	Understand the role of ethics in management	L2
CO4	Apply the knowledge of professional ethics & technical ethics	L3
CO5	Analyse corporate law, ethics, codes & principles	L4
CO6	Evaluate corporate governance & corporate scams	L5



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B.Tech. IV Year I Semester

E-Business

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0050T	2:0:0:0	2	CIE:30 SEE:70	3 Hours	HM-II

Course Objectives:

The objectives of this course are to make the student to:

1. To provide knowledge on emerging concept on E-Business related aspect.
2. To understand various electronic markets & business models.
3. To impart the information about electronic payment systems & banking.
4. To create awareness on security risks and challenges in E-commerce.
5. To the students aware on different e-marketing channels & strategies.

Syllabus	Total Hours: 48
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Unit-I	Electronic Business	8Hrs
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Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of Electronic Commerce (EC)-Advantages & Disadvantages of E-Commerce –E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

Unit-II	Electronic Markets and Business Models	10Hrs
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Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models- Business to Business (B2B)-Business to Customers(B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

Unit-III	Electronic Payment Systems	10Hrs
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Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e-wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage -Electronic Fund Transfer (EFT): Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

Unit-IV	E-Security	10Hrs
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Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) - Firewalls in securing e-business platforms.

Unit-V	E-Marketing	10Hrs
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Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics – E-Customer Relationship Management (eCRM) E-supply chain management (e-SCM)

Text Books:

1. Arati Oturkar&Sunil Khilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

Reference Books:

1. Debjani, Kamalesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill's, 2005
2. Dave Chaffey. E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan. E-Commerce Fundamentals and Application, Raymond Leatham Wiley India 2007
4. S. Jaiswal. E-Commerce Galgotia Publication Pvt Ltd., 2003.



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Online Learning Resources:

<https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771>
<https://www.slideshare.net/VikramNani/e-commerce-business-models>
<https://www.slideshare.net/RiteshGoyal/electronic-payment-system>
<https://www.slideshare.net/WelingkarDLP/electronic-security>
<https://www.slideshare.net/Ankitha2404/emarketing-ppt>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Remember E-Business & its nature, scope and functions.	L1
CO2	Understand E-market-Models which are practicing by the organizations	L2
CO3	Apply the concepts of E-Commerce in the present globalized world.	L3
CO4	Analyse the various E-payment systems & importance of net banking.	L4
CO5	Evaluate market research strategies & E-advertisements.	L5
CO6	Understand importance of E-security & control	L2



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B.Tech. IV Year I Semester

Management Science

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0048T	2:0:0:0	2	CIE:30 SEE:70	3 Hours	HM-II

Course Objectives:

The objectives of this course are to make the student to:

1. To provide fundamental knowledge on Management, Administration, Organization & its concepts.
2. To make the students understand the role of management in Production
3. To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
4. To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
5. To make the students aware of the contemporary issues in modern management

Syllabus		Total Hours: 48
Unit-I	Introduction To Management	8Hrs
Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Elton Mayo's Human relations - Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.		
Unit-II	Operations Management	10Hrs
Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Material Management - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Marketing Management - Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.		
Unit-III	Human Resources Management (Hrm)	10Hrs
HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process - Employee Training and Development - methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration		
Unit-IV	Strategic & Project Management	10Hrs
Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).		
Unit-V	Contemporary Issues In Management	10Hrs
Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention - Business Process Re-engineering and Bench Marking - Knowledge Management – change management –sustainability and corporate social responsibility.		
Text Books:		



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1. Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023
2. A.R Aryasri, Management Science, TMH, 2019

Reference Books:

1. Stoner, Freeman, Gilbert. Management, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich, Management Principles and Guidelines, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

Online Learning Resources:

1. <https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043>
2. <https://nptel.ac.in/courses/112107238>
3. <https://archive.nptel.ac.in/courses/110/104/110104068/>
4. <https://archive.nptel.ac.in/courses/110/105/110105069/>
5. https://onlinecourses.nptel.ac.in/noc24_mg112/

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Remember the concepts & principles of management and designs of organization in a practical world	L1
CO2	Understand the knowledge of Work-study principles & Quality Control techniques in industry	L2
CO3	Apply the process of Recruitment & Selection in organization.	L3
CO4	Analyse the concepts of HRM & different training methods.	L4
CO5	Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to Analyse the business through SWOT.	L5
CO6	Create awareness on contemporary issues in modern management & technology.	L3



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B.Tech. IV Year I Semester

GEO SYNTHETICS AND REINFORCED EARTH STRUCTURES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0138T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-IV

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the concept and applications of reinforced earth, including friction coefficient determination.
2. Analyse the classification, functions, and durability aspects of geosynthetics and their advantages over conventional materials.
3. Design reinforced earth retaining walls considering stability mechanisms and material selection.
4. Evaluate the performance of reinforced embankments and their foundation mattresses for settlement and stability control.
5. Develop reinforced soil beds and Analyse reinforced pavements using standard design approaches.

Syllabus

Total Hours: 48

Unit-I	Reinforced Earth	8Hrs
Concept, Effects of Reinforcement On Soils – Equal Confining and Psuedo Cohesion Concepts, Materials, Friction Coefficient – Definition, Laboratory Determination, Factors Affecting Fiction Coefficient; Application of Reinforced Earth		
Unit-II	Geosynthetics	10Hrs
Advantages Over Conventional Materials - Classification Based On Material Type and Function - Types of Geosynthetics - Functions of Geosynthetics - Tests On Geosynthetics - Durability Aspects of Geosynthetics - Applications of Geosynthetics		
Unit-III	Reinforced Earth Retaining Walls	10Hrs
Introduction, Stability Mechanisms, Design of Reinforced Earth Retaining Wall - Selection of Materials - Geotechnical Analysis - Reinforcement Layout and Spacing - Stability Analysis - Advantages Over Conventional Retaining Walls		
Unit-IV	Reinforced Embankments	10Hrs
Introduction, Design of Reinforced Embankment, Foundation Mattress Below The Embankment - Purpose and Function of Foundation Mattresses - Components of Reinforced Mattress - Design of Reinforced Mattress - Design Calculations for Settlement Control, Bearing Capacity, and Long-Term Performance. Field Implementation and Monitoring Techniques		
Unit-V	Reinforced Soil Beds	10Hrs
Introduction, Factors Affecting The Behaviour of Reinforced Soil Beds, Analysis and Design Reinforced Pavements: Benefits of Placing Reinforcement in Flexible Pavement Layers, Design of Reinforced Pavements By Giroud and Noiray Approach and Modified CBR Method.		

Text Books:

1. An Introduction to Soil Reinforcement and Geosynthetics| By G.L. Siva Kumar Babu, University Press
2. Fundamentals of Geosynthetics Engineering, Sanjay Kumar Shukla and Jian-Hua Yin, CRC Press, 2017, 1st edition.
3. Reinforced Soil and its Engineering Applications, Swami Saran, I.K. International Publishing House Pvt. Ltd., 2019, 1st edition.



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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.



Reference Books:

1. Designing with Geosynthetics by Robert M Koerner, R.M. Pearson Education Inc., 2012, 6th edition
2. Advances in Geosynthetics by G. Venkatapparao, Sai Master Geo environmental Services Pvt. Ltd. Publications
3. Designing with Geosynthetics, Koerner, R.M., Pearson Education Inc., 2012, 6th edition
4. IS:13162-1992; IS:14293 & 94-1995; IS:14324-1995; IS:14714-1999, Geotextiles – Methods of Tests
5. IRC: SP:102-2014: Guidelines for design and construction of reinforced soil walls

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/106/105106052/>
https://onlinecourses.nptel.ac.in/noc20_ce06/preview

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the fundamentals of reinforced earth and Analyse the effects of reinforcement on soil properties.	L2
CO2	Compare different types of geosynthetics, their functions, and durability aspects in geotechnical applications.	L4
CO3	Design reinforced earth retaining walls considering stability mechanisms and reinforcement layouts.	L6
CO4	Evaluate reinforced embankments and foundation mattresses with respect to settlement and load-bearing capacity.	L5
CO5	Design and Analyse reinforced pavements and soil beds using standard methodologies.	L6

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	1	-	1	1	-	-	1	-	1	1	1
CO2	2	1	2	1	1	-	1	-	-	-	-	1	1	1
CO3	2	1	2	1	1	-	1	-	-	-	-	1	1	1
CO4	2	1	2	1	1	1	1	-	-	-	-	1	1	1
CO5	2	1	2	1	1	1	2	-	-	-	-	1	2	1



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B.Tech. IV Year I Semester

RAILWAYS, AIRPORTS, DOCKS AND HARBOR ENGINEERING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0139T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-IV
Course Objectives:					
The objectives of this course are to make the student to:					
<ol style="list-style-type: none"> 1. Understand the components and geometric design principles of railway tracks. 2. Analyse the principles of railway track design, signaling, and interlocking. 3. Evaluate airport site selection, runway orientation, and terminal area planning. 4. Design runways and taxiways based on aircraft characteristics and geometric elements. 5. Assess the requirements and classification of ports, harbors, docks, and navigation aids. 					
Syllabus					Total Hours: 48
Unit-I	Railway Engineering				10Hrs
Introduction – Permanent Way Components – Cross Section of Permanent Way – Functions and Requirements of Rails, Sleepers and Ballast – Types of Gauges – Creep of Rails – Theories Related to Creep – Coning of Wheels – Adzing of Sleepers – Rail Fastenings					
Unit-II	Geometric Design of Railway Track				10Hrs
Gradients – Grade Compensation – Cant and Negative Super Elevation – Cant Deficiency – Degree of Curves – Safe Speed On Railway Track – Points and Crossings – Layout and Functioning of Left Hand Turn Out and Right Hand Turn Outs – Station Yards – Signaling and Interlocking					
Unit-III	Airport Engineering				10Hrs
Airport Site Selection – Factors Affecting Site Selection and Surveys- Runway Orientation – Wind Rose Diagram – Basic Runway Length – Correction for Runway Length – Terminal Area – Layout and Functions – Concepts of Terminal Building – Simple Building , Linear Concept, Pier Concept and Satellite Concept – Typical Layouts					
Unit-IV	Geometric design of runways and taxiways				10Hrs
Aircraft Characteristics – Influence of Characteristics On Airport Planning and Design – Geometric Design Elements of Runway – Standards and Specifications - Functions of Taxiways – Taxiway Geometric Design – Geometric Elements and Standard Specifications – Runway and Taxiway Lighting.					
Unit-V	Ports and Harbors				8Hrs
Harbours - Requirements of Ports and Harbors – Types of Ports – Classification of Harbors – Docks and Types of Docks – Dry Docks, Wharves and Jetties – Breakwaters: Layouts of Different Types of Harbors and Docks – Dredging Operations – Navigation Aids					
Text Books:					
<ol style="list-style-type: none"> 1. A Text Book of Railway Engineering-S.C.Saxena and S.Arora, Dhanpatrai and Sons, New Delhi 2010 2. Highway, railway, Airport and Harbour Engineering – K.P. Subramanian, Scitech Publishers 					
Reference Books:					
<ol style="list-style-type: none"> 1. Harbour, Dock and Tunnel Engineering – R. Srinivasan, Charotar Publishing House Pvt. Limited, 200 2. Railway Track Engineering by J.S.MundreyMcGraw Hill Education 5th edition 2017 3. A Text book of Transportation Engineering – S.P.Chandola – S.Chand& Co. Ltd. – (2001)IRC: SP:102-2014: Guidelines for design and construction of reinforced soil walls 					



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Online Learning Resources:

<https://nptel.ac.in/courses/105107123>

<https://archive.nptel.ac.in/courses/114/106/114106025/>

<https://www.mkube.co.in/product-detail/railways-airports-docks-and-harbour-engineering>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain railway track components, functions, and requirements.	L2
CO2	Apply geometric design principles to railway track layout and interlocking systems.	L3
CO3	Evaluate airport planning aspects, including site selection, runway design, and terminal planning.	L5
CO4	Design runways and taxiways based on geometric standards and safety regulations.	L6
CO5	Analyse ports and harbour structures, including docks, breakwaters, and navigation aids.	L4

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	-	1	-	-	-	1	-	1	1	1
CO2	3	2	2	1	2	-	-	-	-	-	-	1	2	1
CO3	3	2	3	2	2	-	1	-	-	-	-	1	2	2
CO4	3	1	2	2	3	1	-	-	-	-	-	1	2	2
CO5	3	2	2	1	2	1	-	-	-	-	-	1	2	1



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B.Tech. IV Year I Semester

EXPERIMENTAL STRESS ANALYSIS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0140T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-IV

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the principles and advantages of experimental stress analysis.
2. Explain strain measurement techniques using strain gauges and their applications.
3. Analyse strain rosettes and apply non-destructive testing methods for concrete.
4. Understand the fundamental principles of photo elasticity and its applications.
5. Apply two-dimensional photo elasticity methods for stress analysis in materials.

Syllabus	Total Hours: 48
Unit-I	Principles Of Experimental Approach
Merits of Experimental Analysis Introduction, Uses of Experimental Stress Analysis Advantages of Experimental Stress Analysis, Different Methods –Simplification of Problems	
Unit-II	Strain Measurement Using Strain Gauges
Definition of Strain and Its Relation of Experimental Determinations Properties of Strain- Gauge Systems-Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges. Introduction to Electrical Strain Gauges - Inductance Strain Gauges – LVDT – Resistance Strain Gauges – Various Types –Gauge Factor – Materials of Adhesion Base	
Unit-III	Strain Rosettes And Non – Destructive Testing Of Concrete
Introduction – The Three Elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge. Ultrasonic Pulse Velocity Method –Application to Concrete. Hammer Test – Application to Concrete.	
Unit-IV	Theory of Photo elasticity
Introduction –Temporary Double Refraction – The Stress Optic Law –Effects of Stressed Model in A Polar Scope for Various Arrangements – Fringe Sharpening. Brewster's Stress Optic Law	
Unit-V	Two Dimensional Photo elasticity
Introduction – Isochromic Fringe Patterns- Isoclinic Fringe Patterns Passage of Light Through Plane Polariscope and Circular Polariscope - Isoclinic Fringe Patterns – Compensation Techniques – Calibration Methods – Separation Methods – Scaling Model to Prototype Stresses – Materials for Photo – Elasticity Properties of Photo elastic Materials.	

Text Books:

1. Experimental stress analysis by J.W.Dally and W.F.Riley, College House Enterprises 2005
2. Experimental stress analysis by Dr.Sadhu Singh. khanna Publishers 4th edition

Reference Books:

1. Experimental Stress analysis by U.C.Jindal, Pearson Publications 2012 edition
2. Experimental Stress Analysis by L.S.Srinath, MC.Graw Hill Company Publishers

Online Learning Resources:

<https://archive.nptel.ac.in/courses/112/106/112106068/#>
<https://archive.nptel.ac.in/courses/112/106/112106198/#>



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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.



Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the principles and merits of experimental stress analysis.	L2
CO2	Demonstrate strain measurement using various strain gauge techniques.	L3
CO3	Analyse strain rosette data and evaluate concrete structures using NDT methods.	L4
CO4	Apply the theory of photo elasticity to determine stress distributions in materials.	L3
CO5	Utilize two-dimensional photo elasticity techniques for experimental stress analysis.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	2	-	-	-	1	-	1	1	1
CO2	3	2	2	2	2	3	-	-	-	-	-	1	2	2
CO3	2	2	3	2	2	3	2	-	-	-	-	1	2	2
CO4	3	2	2	2	2	3	2	-	-	-	-	1	2	2
CO5	2	2	2	2	2	3	2	-	-	-	-	1	2	2



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B.Tech. IV Year I Semester

GROUND IMPROVEMENT TECHNIQUES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0141T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-V

Course Objectives:

The objectives of this course are to make the student to:

1. Understand various dewatering methods, including sumps, well points, and electro-osmosis, for effective groundwater control.
2. Analyse the properties and applications of grouts, grouting techniques, and post-grouting tests for soil and rock stabilization.
3. Evaluate different densification techniques for granular and cohesive soils, such as vibro-compaction, preloading, and thermal methods.
4. Apply stabilization techniques, including mechanical, chemical, and bituminous stabilization, to improve soil properties.
5. Assess the design principles of reinforced earth walls and the role of geosynthetics in soil improvement and slope stability. (Bloom's Level: Evaluate – L5).

Syllabus		Total Hours: 48
Unit-I	Expansive Soils	8Hrs
Problems of Expansive Soils – Tests for Identification – Methods of Determination of Swell Pressure. Improvement of Expansive Soils – Foundation Techniques in Expansive Soils – Under Reamed Piles.		
Unit-II	Dewatering & Grouting	10Hrs
DEWATERING: Methods of De-Watering- Sumps and Interceptor Ditches- Single, Multi Stage Well Points – Vacuum Well Points- Horizontal Wells-Foundation Drains-Blanket Drains – Criteria for Selection of Fill Material Around Drains –Electro-Osmosis . GROUTING: Objectives of Grouting- Grouts and Their Properties- Grouting Methods-Ascending, Descending and Stage Grouting- Hydraulic Fracturing in Soils and Rocks- Post Grout Test		
Unit-III	Densification Methods In Granular & Cohesive Soils	10Hrs
DENSIFICATION METHODS in GRANULAR SOILS:- In – Situ Densification Methods in Granular Soils:- Vibration At The Ground Surface, Impact At The Ground Surface, Vibration At Depth, Impact At Depth. DENSIFICATION METHODS in COHESIVE SOILS:- In – Situ Densification Methods in Cohesive Soils:- Preloading Or Dewatering, Vertical Drains – Sand Drains, Sand Wick Geo drains – Stone and Lime Columns – Thermal Methods		
Unit-IV	Stabilisation Methods	10Hrs
Methods of Stabilization-Mechanical-Cement- Lime-Bituminous-Chemical Stabilization With Calcium Chloride, Sodium Silicate and Gypsum		
Unit-V	Reinforced Earth & Geo synthetics	10Hrs
REINFORCED EARTH: Principles – Components of Reinforced Earth – Factors Governing Design of Reinforced Earth Walls – Design Principles of Reinforced Earth Walls. GEOSYNTHETICS: Geotextiles-Types, Functions and Applications – Geogrids and Geo Membranes – Functions and Applications		

Text Books:

1. Engineering Principles of Ground Modification, Haussmann M.R. , McGraw-Hill International Edition(1990).



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2. Ground Improvement Techniques, Dr.P.Purushotham Raj. Laxmi Publications, New Delhi University science press, New Delhi 2nd edition 2016

Reference Books:

1. Ground Improvement, Moseley M.P. Blackie Academic and Professional, Boca Taton, Florida, USA(1993).
2. Ground Improvement Techniques, Nihar Ranajan Patra Vikas Publications, New Delhi
3. Ground Control and Improvement, Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) John Wiley and Sons, New York, USA.

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/108/105108075/>

<https://archive.nptel.ac.in/courses/105/105/105105210/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the methods of dewatering and grouting and their importance in foundation engineering.	L2
CO2	Analyse densification techniques for granular and cohesive soils to enhance soil strength.	L4
CO3	Evaluate the effectiveness of soil stabilization methods for different ground conditions.	L5
CO4	Apply reinforced earth principles and geosynthetics for soil retention and foundation stability.	L3
CO5	Assess expansive soil problems, their identification methods, and suitable foundation techniques like under-reamed piles.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	-	-	-	-	2	-	1	2	2
CO2	3	3	2	2	2	-	-	-	-	2	-	2	2	2
CO3	3	3	3	2	2	-	-	-	-	2	-	2	3	2
CO4	3	2	3	3	3	-	-	-	-	2	1	2	3	3
CO5	3	3	3	3	3	-	-	-	-	2	1	2	3	3



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B.Tech. IV Year I Semester

SUBSURFACE INVESTIGATION AND INSTRUMENTATION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0142T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-V
Course Objectives:					
The objectives of this course are to make the student to:					
<ol style="list-style-type: none"> 1. Understand the fundamental concepts of soil formation, classification, and stratification processes. 2. Analyse various soil exploration methods, including boring, drilling, and sampling techniques. 3. Evaluate borehole logging methods and groundwater observations for site investigation. 4. Apply field testing techniques such as SPT, PLT, PMT, CPT, and geophysical methods to assess soil properties. 5. Assess soil exploration report preparation, including instrumentation and data interpretation. 					
Syllabus					Total Hours: 48
Unit-I	Introduction				8Hrs
Soil formation, Types of Soils, Physical and Chemical Weathering, Soil Transport, Deposition and Stratification Phenomena and Soil Classification.					
Unit-II	Methods of Soil Exploration				10Hrs
Methods of Boring, Auguring and Drilling. Machinery Used for Drilling, Types of Augers and Their Usage for Various Projects. Soil Sampling: Sampling Methods, Types of Samples, Storage of Samples and Their Transport. Sample Preparation, Sample Sizes, Types of Sampler's Specifications for Testing.					
Unit-III	Bore hole Logging				10Hrs
Logging of Boreholes - Logging Methods - Groundwater Observations – Water Table Fluctuations and Effects - Preparation of Soil Profiles and Exploration Report.					
Unit-IV	Field Testing of Soils				10Hrs
Methods and Specifications – Visual Identification Tests, Standard Penetration Test (SPT), Plate Load Test (PLT), Pressure Meter Test (PMT) Dilatometer Test (DMT) Vane Shear Test (VST), Cone Penetration Test (CPT), Becker Penetration Test (BPT), Analysis of Test Results. Geophysical Methods of Soil Exploration- Seismic Refraction, Electrical Resistivity, Cross Hole Test.					
Unit-V	Report Writing				10Hrs
Soil Exploration Reports- Identification, Calculations and Preparation. Field Instrumentation: Strain Gauges, Piezometer, Pressure Cells, Inclinometers, Proving Ring, Load Cells, Displacement Gauges					
Text Books:					
<ol style="list-style-type: none"> 1. Site Investigation, Clayton C. R., Matthews M. C and Simons N. E., Blackwell Science. 2005 2. Geotechnical Instrumentation for Monitoring Field Performance, John Dunn cliff, Wiley Inter science, 2008 					
Reference Books:					
<ol style="list-style-type: none"> 1. Basic and Applied Soil Mechanics- A.S. Rao and Gopal Ranjan, New Age International. 2. IS:1892-Code of Practice for subsurface investigation for foundation, 1979 3. IS: SP36 Part 1-Compendium of India Standards on Soil Engineering-Laboratory Testing of Soils for Civil Engineering Purposes, 1987. 					



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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.



4. IS: SP36 Part 2-Compendium of India Standards on Soil Engineering-Field Testing of Soils for Civil Engineering Purposes, 1988.

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/103/105103182/>

https://onlinecourses.nptel.ac.in/noc25_ce27/preview

https://onlinecourses.nptel.ac.in/noc22_ce81/preview

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain soil formation processes, classification methods, and stratification phenomena.	L2
CO2	Analyse soil exploration methods and sampling techniques for various geotechnical applications.	L4
CO3	Evaluate borehole logging, groundwater observations, and their influence on soil properties.	L5
CO4	Apply field testing procedures, including penetration tests and geophysical methods, to assess subsurface conditions.	L3
CO5	Assess soil exploration report writing and field instrumentation techniques for site investigations.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	2	2	1	-	2	-	2	2	2
CO2	3	3	2	3	2	2	3	1	-	2	-	2	2	2
CO3	3	3	3	3	3	2	3	2	-	2	-	2	3	3
CO4	3	2	3	3	3	3	3	2	-	2	2	2	3	3
CO5	3	3	3	3	3	3	3	2	-	2	2	2	3	3



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B.Tech. IV Year I Semester

TRANSPORTATION ECONOMICS

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0143T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	PE-V

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamentals of transportation project development and decision-making.
2. Analyse transportation costs, including agency and user costs.
3. Evaluate vehicle operating costs and traffic congestion economics.
4. Apply economic evaluation methods for transportation projects.
5. Assess financing methods and risk analysis in transportation projects.

Syllabus		Total Hours: 48
Unit-I	Introductory Concepts in Transportation Decision Making	8Hrs
Overall Transportation Project Development, Budgeting, Financial Planning, The Process of Transportation Project Development, Models Associated With Transportation Impact Evaluation Professional Ethics.		
Unit-II	Transportation Costs	10Hrs
Classification of Transportation Costs, Transportation Agency Costs, Transportation User Costs, General Structure and Behavior of Cost Functions and Road Pricing. Estimating Transportation Demand and Supply - Supply Equilibration, Dynamics of Transportation Demand and Supply, Elasticity of Travel Demand and Supply, Classification of Elasticity		
Unit-III	Vehicle Operating Costs	10Hrs
Fuel Costs - Maintenance and Spares, Depreciation - Crew Costs - Value of Travel Time Savings - Accident Costs. Economics of Traffic Congestion - Pricing Policy		
Unit-IV	Economic Analysis of Projects	10Hrs
Methods of Evaluation - Cost-Benefit Ratio, First Year Rate of Return, Net Present Value, and Internal-Rate of Return Methods; Indirect Costs and Benefits of Transport Projects		
Unit-V	Financing of Road Project	10Hrs
Methods – Private Public Partnership (PPP) - toll Collection - Economic Viability of Design-Build-Operate-Transfer Schemes – Risk Analysis – Value for Money Analysis - Case Studies.		

Text Books:

1. Winfrey, Economic analysis for Highways, International Textbook Company, Pennsylvania, 1969.
2. Sarkar, P. K., and Maitri, V., Economics in Highway and Transportation Planning, Standard Publisher, New Delhi, 2010.

Reference Books:

1. IRC, Manual on Economic Evaluation of Highway Projects in India, SP30, 2007
2. David, H., and Brewer, A., Transport: An Economics and Management Perspective. Oxford University Press, UK, 2000.
3. Quinet, E., and Vickerman, R., Principles of Transport Economics, Edward Elgar Pub, 2005
4. Button, K. J., Transport Economics, Elgar, 2010



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Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/104/105104098/>

<https://archive.nptel.ac.in/content/storage2/courses/105101087/01-Ltexhtml/p2/p.html>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Describe the overall process of transportation project development and financial planning.	L2
CO2	Analyse transportation cost structures, including demand and supply elasticity.	L4
CO3	Evaluate vehicle operating costs and traffic congestion pricing strategies.	L5
CO4	Apply economic analysis techniques to assess the feasibility of transportation projects.	L3
CO5	Assess financial models, PPP strategies, and risk analysis for road projects.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	-	-	-	-	2	-	2	2	2
CO2	3	3	3	3	3	-	-	-	-	2	-	2	3	2
CO3	3	3	3	3	2	-	-	-	-	2	-	2	3	3
CO4	3	3	3	3	2	-	-	-	-	2	-	2	3	3
CO5	3	3	3	3	3	3	3	3	-	2	-	2	3	3



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B.Tech. IV Year I Semester

SKILLS IN CIVIL ENGINEERING SOFTWARE. (STAADPRO/CAD/TEKLA)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0144T	0:1:2:0	2	CIE:30 SEE:70	3 Hours	SEC

Course Objectives:

The objectives of this course are to make the student to:

1. Provide fundamental knowledge of Auto CAD and Tekla for 2D drafting and 3D modeling.
2. Train students in structural analysis and design using STAAD. Pro
3. Develop skills in reinforcement detailing and structural component modeling.
4. Introduce seismic and nonlinear analysis for structural safety evaluation.
5. Enable students to apply civil engineering software tools for real-world projects.

Syllabus

Total Hours: 48

List of Experiments:-

1. Determination of Basic Drawing and Editing Commands in AutoCAD
2. Creation of a 2D Floor Plan for a Residential Building in AutoCAD
3. Development of Structural Detailing for Beams and Columns in AutoCAD
4. Application of Reinforcement Detailing for Slabs and Footings in AutoCAD
5. Creation and analysis of a steel column using TEKLA
6. Modelling a Roof Truss by TEKLA
7. Design of a Composite Beam by TEKLA
8. Column Base Plate Design by TEKLA
9. Determination of STAAD. Pro Interface and Structural Model Setup
10. Analysis and Design of a Simply Supported Beam in STAAD. Pro
11. Development of Structural Analysis for a Multi-Story RCC Building in STAAD. Pro
12. Application of Seismic Load Analysis on a Building Structure in STAAD. Pro

Text Books:

1. George Omura, Brian C. Benton – Mastering AutoCAD 2025 and AutoCAD LT 2025, Wiley, 2025 Edition
2. TEKLA Structural Designer 2023 Engineers Hand Book by Trimble Solutions Corporation

Reference Books:

1. Phil Read, Eddy Krygiel, James Vandezande – BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, and Contractors, John Wiley & Sons, 4th Edition, 2023
2. NighatYasmin Ph.D., Introduction to AutoCAD 2025 for Civil Engineering Applications, SDC Publications, 2024 Edition.

Course Outcomes:

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

COs	Statements	Blooms level
CO1	Create 2D drawings and structural detailing using AutoCAD.	L6



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CO2	Develop 3D building models and Analyse site topography in Revit.	L6
CO3	Perform structural analysis and design of multi-story buildings using STAAD.Pro and ETABS.	L3
CO4	Conduct seismic and performance-based analysis for high-rise structures.	L3
CO5	Apply SAP2000 for bridge modeling, water tank design, and advanced structural systems.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	2	-	-	1	-	1	1	1	2	1
CO2	3	1	2	-	3	-	-	2	-	2	2	2	1	1
CO3	3	1	2	-	3	-	-	2	-	2	2	2	2	2
CO4	3	1	1	-	3	-	-	1	-	1	1	1	1	2
CO5	3	1	1	-	3	-	-	1	-	1	1	1	1	1



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B.Tech. IV Year I Semester

Gender Sensitization

(Audit Course)

(Common to All Branches of Engineering)

Course Code	L:T:P	Credits	Exam Marks	Exam Duration	Course Type
23A0054T	2:0:0	0	CIE:30	3 Hours	Audit Course

Course Objectives: The objectives of the course are to make the students learn about

- To enable students to understand the gender related issues, vulnerability of women and men
- To familiarize them about constitutional safeguard for gender equality
- To expose the students to debates on the politics and economics of work
- To help students reflect critically on gender violence
- To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

Syllabus

Total Hours:24

Unit-I	Understanding Gender	5Hrs
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Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit-II	Gender Roles and Relations	5Hrs
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Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences-Declining Sex Ratio- Demographic Consequences-Gender Spectrum.

Unit-III	Gender and Labour	5Hrs
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Division and Valuation of Labour-Housework: The Invisible Labor- —My Mother doesn't Work. —Share the Load. —Work: Its Politics and Economics -Fact and Fiction- Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit-IV	Gender-Based Violence	5Hrs
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The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit-V	Gender and Culture	4Hrs
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Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues- Gender Sensitive Language- Just Relationships

Course Outcomes(CO):

Upon completion of this course, students should be able to:

- Understand the basic concepts of gender and its related terminology L1, L2,
- Identify the biological, sociological, psychological and legal aspects of gender.
- Use the knowledge in understanding how gender discrimination works in our society and how to counter it.
- Analyze the gendered division of labour and its relation to politics and economics.
- Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups
- Develop students' sensibility with regard to issues of gender in contemporary India



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Text Books:

1. A.Suneetha, Uma Bhrugubanda, et al. Towards a World of Equals: A Bilingual Textbook on Genderll, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. Gender Trouble: Feminism and the Subversion of Identity. UK Paperback Edn. March 1990

Reference Books:

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors: The dowry Problems in India,London :Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), Women in Developing Countries, Assessing Strategies for Empowerment, London: Lynne Rienner Publishers, 2002
3. Brush, Lisa D., Gender and Governance, New Delhi, Rawat Publication, 2007
4. Singh, Direeti, Women and Politics World Wide, New Delhi, Axis Publications, 2010
5. Raj Pal Singh, Anupama Sihag, Gender Sensitization: Issues and Challenges (English, Hardcover), Raj Publications, 2019
6. A.Revathy& Murali, Nandini, A Life in Trans Activism(Lakshmi Narayan Tripathi). The University of Chicago Press, 2016

Online Learning Resources:

Understanding Gender chrome-extension:

- <https://www.arvindguptatoys.com/arvindgupta/kamlagender1.pdf>
- https://onlinecourses.swayam2.ac.in/nou24_hs53/preview

Gender Roles and Relations

- <https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-genderroles-and-stereotypes>
- <https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408>
- https://onlinecourses.swayam2.ac.in/cec23_hs29/preview

Gender and Labour

- <https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-canit-be-redressed>
- https://onlinecourses.nptel.ac.in/noc23_mg67/preview

Gender-Based Violence

- https://eige.europa.eu/gender-based-violence/what-is-gender-basedviolence?language_content_entity=en
- <https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls>
- https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

Gender and Culture

- <https://gender.study/psychology-of-gender/culture-impact-gender-roles-identities/>
- <https://sociology.iresearchnet.com/sociology-of-culture/gender-and-culture/>
- <https://archive.nptel.ac.in/courses/109/106/109106136/>
- the content of Sohaila Abdulali's "I Fought For My Life...and Won"
(<http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/>)



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B.Tech. IV Year I Semester

SMART GRID TECHNOLOGIES

(Common to All Branches of Engineering Except EEE)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0241T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-III

Course Objectives:

The objectives of the course are to make the students learn about:

- To understand the evolution of electric grids and the necessity of Smart Grids, by comparing conventional systems with modern smart grids, studying enabling technologies, international deployment experiences, and India's Smart Grid road map and architecture.
- To gain knowledge of Wide Area Monitoring Systems (WAMS) through the fundamentals of synchrophasor technology, structure and operation of PMUs and PDCs, applications in blackout analysis, and case studies on real-time system monitoring and control.
- To study the features, types, and functional specifications of Smart Meters, and to analyze AMR and AMI systems, their drivers, benefits, protocols, and applications in demand-side management such as peak load, outage, and power quality management.
- To acquire an understanding of information and communication technologies in Smart Grids, covering communication system requirements, modulation and demodulation techniques, and technologies like Radio, Mobile, Power Line, and Optical Fibre Communication along with smart grid protocols.
- To explore Smart Grid applications and integration of emerging energy technologies, such as renewable energy systems, distributed generation, protective relaying, home area networks, advanced energy storage technologies, and Plug-in Hybrid Electric Vehicles.
- To identify, assess, and address cybersecurity challenges in Smart Grids, focusing on risks in AMI, DG, automation, and EV management systems, while studying methodologies, security requirements, and Smart Grid Information Models for secure operations.

Syllabus		Total Hours: 48Hrs
Unit-I	Introduction to Smart Grid	10Hrs
Evolution of Electric Grid – Need for Smart Grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in Smart Grid deployment efforts – Smart Grid road map for India – Smart Grid Architecture		
Unit-II	Wide Area Monitoring System	9Hrs
Fundamentals of Synchro phasor Technology – concept and benefits of Wide Area Monitoring System – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road Map for Synchrophasor applications (NAPSI) – Operational experience and Blackout analysis using PMU - Case study on PMU.		
Unit -III	Smart Meters	10Hrs
Features and functions of Smart Meters – Functional specification – category of Smart Meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand Side Integration: Peak load, Outage and Power Quality management.		
Unit -IV	Information and Communication Technology	10Hrs
Overview of Smart Grid Communication system – Modulation and Demodulation Techniques: Radio Communication – Mobile Communication – Power Line Communication – Optical Fibre Communication – Communication Protocol for Smart Grid		
Unit -V	Smart Grid Applications and Cyber Security	9Hrs
Applications : Overview and concept of Renewable Integration – Introduction to distributed generation - Role of Protective Relaying in Smart Grid – House Area Network – Advanced Energy Storage Technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug – in Hybrid electric Vehicles -		

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Cyber Security: Security issues in DG, Distribution Automation, AMI, Electric Vehicle Management Systems – Approach to assessment of smart grid cyber security risks – Methodologies. Cyber Security requirements – Smart Grid Information Model.

Course Outcomes(CO):

After the completion of the course students will able to:

- Understanding the Concept and Evolution of Smart Grids.
- Analyzing Wide Area Monitoring System and Synchrophasor Technology.
- Applying Smart Metering and Advanced Metering Infrastructure (AMI) Concepts.
- Evaluating Information and Communication Technology (ICT) Systems in Smart Grids.
- Designing Smart Grid Applications and Cybersecurity Measures.

Textbooks:

1. James Momoh, "SMART GRID : Fundamentals of Design and Analysis", John Wiley and Sons, New York, 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & Sons, New Jersey, 2012.

Reference Books:

1. Power Grid Corporation of India Limited, "Smart Grid Primer", 1st Edition, Power Grid Corporation of India Limited, Bangalore, India, 2013. *B.Tech - CSE R23 Regulation 149*
2. Fereidoon.P.Sioshansi, "Smart Grid – Integrating Renewable, Distributed and Efficient Energy", 1st Edition, Academic Press, USA, 2011.
3. Stuart Borlase, "Smart Grids: Infrastructure, Technology and Solutions", 1st Edition, CRC Press Publication, England, 2013.
4. Phadke A G, Thorp J S, "Synchronized Phasor Measurements and Their Applications", 1st Edition, Springer, Newyork, 2012.



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B.Tech. IV Year I Semester

3D Printing Technologies

CSE, CSE-AIML, CSE-CS, CSE-DS, CE, ECE, EEE

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0334T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE-III

Course Objectives:

- Understand the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods.
- Demonstrate the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems.
- Define the processes and classifications of rapid tooling and reverse engineering techniques.
- Identify common errors in 3D printing and evaluate pre-processing, processing, and post-processing issues.
- Familiarize RP-related software and its role in applications such as design, manufacturing, and medical fields

Syllabus		Total Hours:48
Unit- I	Introduction to 3D Printing	9Hrs
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP		
Unit-II	Solid and Liquid Based RP Systems	10Hrs
Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC)		
Unit-III	Powder Based & Other RP Systems	10Hrs
<p>Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).</p> <p>Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballistic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).</p>		
Unit-IV	Rapid Tooling & Reverse Engineering	10Hrs
<p>Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.</p> <p>Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development</p>		
Unit-V	Errors in 3D Printing and Applications	9Hrs
<p>Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc.</p> <p>Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.</p> <p>Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP</p>		

Course Outcomes(CO):

On completion of this course, student will be able to

- Define and explain the evolution and need for rapid prototyping in modern product development.
- Compare and contrast various 3D printing technologies based on working principles, materials, and limitations.



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- Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications.
- Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions.
- Use RP-specific software tools to manipulate STL files and prepare models for printing in real-world scenarios.

Text Books:

1. Chee Kai Chua and Kah Fai Leong, 3D Printing and Additive Manufacturing Principles and Applications 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Springer, 2/e, 2010

Reference Books:

1. Frank W.Liou, Rapid Prototyping & Engineering Applications, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006

Online Learning Resources:

- <https://nptel.ac.in/courses/112/104/112104265/>
- <https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/>
- <https://slideplayer.com/slide/6927137/>
- <https://www.mdpi.com/2073-4360/12/6/1334>
- <https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf>
- <https://lecturenotes.in/subject/197>
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdfcompressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- <https://www.youtube.com/watch?v=NkC8TNts4B4>



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B.Tech. IV Year I Semester

INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS (Common To All Branches Except ECE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
23A0416T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-III

Course Objectives:

- To learn the fundamental architectural concepts of microprocessors.
- To gain knowledge about assembly language programming concepts.
- To get familiar about 8086 interfacing.
- To understand the fundamentals of the 8051 Microcontroller.
- To learn interfacing with the 8051 Microcontroller.

Syllabus	Total Hours: 45
Unit-I	9 Hrs
Microprocessor: Introduction to Microprocessors, Main features of 8086 Microprocessor, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.	
Unit-II	9 Hrs
8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.	
Unit -III	9 Hrs
8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDs, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.	
Unit -IV	9 Hrs
Microcontroller: Introduction to RISC Processors, Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.	
Unit -V	9 Hrs
Interfacing Microcontroller: Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor and Microcontroller.	

Textbooks:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

Reference Books:

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1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

Course Outcomes(CO):

On completion of this course, student will be able to:

- CO1:** Learn the fundamental architectural concepts of microprocessors.
- CO2:** Gain knowledge about assembly language programming concepts.
- CO3:** Understand the concepts of 8086 interfacing.
- CO4:** Learn the fundamentals of the 8051 Microcontroller.
- CO5:** Know the interfacing with the 8051 Microcontroller.
- CO6:** Understand the concepts of interfacing 8051 Microcontroller.



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B.Tech. IV Year I Semester

DATABASE MANAGEMENT SYSTEMS

(Common to all branches except CSE aligned)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0512T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE-III

Course Objectives:

This course will enable students to:

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes (CO):

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

- Understand the basic concepts of database management systems
- Analyze a given database application scenario to use ER model for conceptual design of the database
- Utilize SQL proficiently to address diverse query challenges
- Employ normalization methods to enhance database structure
- Assess and implement transaction processing, concurrency control and database recovery protocols in databases.

Syllabus

Total Hours: 45

Module-I	Introduction	9 Hrs
<p>Introduction: Data base system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.</p> <p>Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams</p>		
Module-II	Relational Model:	9 Hrs
<p>Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Data base schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).</p>		
Module-III	SQL	9 Hrs
<p>SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.</p>		
Module-IV	Schema Refinement	9 Hrs



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Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce- Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

Module-V	Transaction Concept	9 Hrs
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Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. **Introduction to Indexing Techniques:** B+ Trees, operations on B+Trees, Hash Based Indexing:

Textbooks:

1. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4).
2. Database System Concepts, 5th edition, Silberschatz, Korth, Sudarsan, TMH (For Chapter 1 and Chapter 5)

Reference Books:

1. Introduction to Database Systems, 8th edition, C J Date, Pearson.
2. Database Management System, 6th edition, Ramez Elmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web Resources:

1. <https://nptel.ac.in/courses/106/105/106105175/>
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview



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B.Tech. IV Year I Semester

CYBER SECURITY

(Common to all branches except CSE aligned)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0532Tb	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OE-III

Course Objectives:

The course is designed to provide awareness on different cyber-crimes, cyber offenses, tools and methods used in cybercrime.

Course Outcomes (CO):

After completion of the course, students will be able to

- Classify the cybercrimes and understand the Indian ITA 2000
- Analyse the vulnerabilities in any computing system and find the solutions
- Predict the security threats of the future
- Investigate the protection mechanisms
- Design security solutions for organizations

Syllabus

Total Hours:42

Module-I	Introduction to Cybercrime	8Hrs
<p>Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.</p>		
Module-II	Cyber Offenses: How Criminals Plan Them	9Hrs
<p>Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing</p>		
Module-III	Cybercrime: Mobile and Wireless Devices	9Hrs
<p>Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.</p>		
Module-IV	Tools and Methods Used in Cybercrime	8Hrs
<p>Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.</p>		
Module-V	Cyber Security: Organizational Implications	8Hrs
<p>Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.</p>		

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.



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Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
Introduction to Cyber Security, Chwan- Hwa(john) Wu, J. David Irwin. CRC Press T&F Group

Web Resources:

1. <http://nptel.ac.in/courses/106105031/40>
2. <http://nptel.ac.in/courses/106105031/39>
3. <http://nptel.ac.in/courses/106105031/38>



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B.Tech. IV Year I Semester

Wavelet Transforms and Its Applications

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0031T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-III

Course Objectives:

The objectives of the course are to make the students learn about:

- To introduce the fundamentals of wavelets, wavelet expansion, and transform techniques.
- To understand multiresolution analysis, scaling functions, and wavelet functions.
- To apply filter banks for analysis and synthesis in discrete wavelet transform.
- To analyze time-frequency characteristics and computational aspects of wavelet transforms.
- To study orthogonal, biorthogonal bases, frames, and their matrix representations.
- To develop problem-solving skills by applying wavelet methods to signal analysis and processing.

Syllabus		Total Hours: 48Hrs
Unit-I	Wavelets	10Hrs
Wavelets and Wavelet Expansion Systems – Wavelet Expansion- Wavelet Transform- Wavelet System-More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform- The Discrete-Time and Continuous Wavelet Transforms.		
Unit-II	A Multiresolution Formulation of Wavelet Systems	9Hrs
Signal Spaces -The Scaling Function -Multiresolution Analysis – The Wavelet Functions – The Discrete Wavelet Transform- A Parseval's Theorem – Display of the Discrete Wavelet Transform and the Wavelet Expansion.		
Unit -III	Filter Banks and the Discrete Wavelet Transform	10Hrs
Analysis – From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis – From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching – Input Coefficients – Lattices and Lifting - -Different Points of View.		
Unit -IV	Time-Frequency and Complexity	10Hrs
Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms – The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.		
Unit -V	Bases and Matrix Examples	9Hrs
Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples – Fourier Series Example – Sine Expansion Example – Frames and Tight Frames – Matrix Examples -Sine Expansion as a Tight Frame Example.		

Course Outcomes(CO):

After the completion of the course students will able to:

- Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms
- Illustrate the multi resolution analysis ad scaling functions.
- Implement discrete wavelet transforms with multirate digital filters
- Understand multi resolution analysis and identify various wavelets and evaluate their time-frequency resolution properties.
- Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields

Textbooks:

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1. C. Sidney Burrus, Ramesh A. Gopinath, "Introduction to Wavelets and Wavelets Transforms", Prentice Hall, (1997).
2. James S. Walker, "A Primer on Wavelets and their Scientific Applications", CRC Press, (1999)..

Reference Books:

1. RaghuvverRao, "Wavelet Transforms", Pearson Education, Asia
2. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

Web Resources:

1. <http://users.rowan.edu/~polikar/WAVELETS/Wttutorial.html>
2. <http://www.wavelet.org/>
3. <http://www.math.hawaii.edu/~dave/Web/Amara's%20Wavelet%20Page.htm>
4. <https://jqichina.wordpress.com/wp-content/uploads/2012/02/ten-lectures-ofwaveletsefbc88e5b08fe6b3a2e58d81e8aeb2efbc891.pdf>



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B.Tech. IV Year I Semester

SMART MATERIALS AND DEVICES

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0036T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-III

Course Objectives:

The objectives of the course are to make the students learn about:

- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To explain the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

Syllabus		Total Hours: 48Hrs
Unit-I	Introduction to Smart Materials	10Hrs
Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magnetorheological materials, photoactive materials, Polymers and polymer composites (Basics).		
Unit-II	Properties of Smart Materials	9Hrs
Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.		
Unit -III	Synthesis of Smart Materials	10Hrs
Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.		
Unit -IV	Characterization Techniques	10Hrs
Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).		
Unit -V	Smart Materials based Devices	9Hrs
Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.		

Course Outcomes(CO):

After the completion of the course students will able to:

- Identify key discoveries that led to modern applications of shape memory materials, describe the two phases in shape memory alloys.
- Describe how different external stimuli (light, electricity, heat, stress, and magnetism) influence smart material properties.
- Summarize various types of synthesis of smart materials.
- Analyze various characterization techniques used for smart materials.
- Interpret the importance of smart materials in various devices

Textbooks:

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2017
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

Reference Books:

1. Gauenzi,P.,Smart Structures, Wiley, 2009.
2. MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 201

Web Resources:

NPTEL course link: https://onlinecourses.nptel.ac.in/noc22_me17/preview



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B.Tech. IV Year I Semester

Introduction to Quantum Mechanics

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0037T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-III

Course Objectives:

The objectives of the course are to make the students learn about:

- To understand the fundamental differences between classical and quantum mechanics.
- To study wave-particle duality, uncertainty principle, and their implications.
- To learn and apply Schrödinger equations to basic quantum systems.
- To use operator formalism and mathematical tools in quantum mechanics.
- To explore angular momentum, spin and their quantum mechanical representations.

Syllabus	Total Hours: 48Hrs
Unit-I	10Hrs

Principles of Quantum Mechanics

Introduction: Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation. Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle. Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions

Unit-II	One Dimensional Problems and Solutions	9Hrs
Unit-II	One Dimensional Problems and Solutions	9Hrs

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

Unit -III	Operator Formalism	10Hrs
Unit -III	Operator Formalism	10Hrs

Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

Unit -IV	Mathematical Tools for Quantum Mechanics	10Hrs
Unit -IV	Mathematical Tools for Quantum Mechanics	10Hrs

The concept of row and column matrices, Matrix algebra, Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

Unit -V	Angular Momentum and Spin	9Hrs
Unit -V	Angular Momentum and Spin	9Hrs

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half($1/2$), Spin angular momentum, Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.

Course Outcomes(CO):

After the completion of the course students will able to:

- Explain the key principles of quantum mechanics and wave-particle duality.
- Apply Schrödinger equations to solve one-dimensional quantum problems.
- Solve quantum mechanical problems using operator and matrix methods.
- Evaluate quantum states using Dirac notation and expectation values.
- Analyze angular momentum and spin systems using Pauli matrices and operators.

Textbooks:

1. Quantum Mechanics. Vol 1, A. MessiaiaNoth-Holland Pub. Co., Amsterdam,(1961).
2. A Text Book of Quantum Mechanics. P.M.Mathews and K.Venkatesam, Tata McGraw Hill, New Delhi,(1976).
3. Introduction to Quantum Mechanics. R.H.Dicke and J.P.Witke, Addison-Wisley Pub.Co.Inc.,London, (1960).

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4. Quantum Mechanics. S.L.Gupta, V.Kumar, H.V.Sarama and R.C.Sharma, Jai PrakashNath& Co, Meerut, (1996).

Reference Books:

1. Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).
2. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003.

Web Resources:

1. <https://archive.nptel.ac.in/courses/115/101/115101107/>
2. <https://archive.nptel.ac.in/courses/122/106/122106034/>
3. <https://nptel.ac.in/courses/115106066>



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B.Tech. IV Year I Semester

Green Chemistry and Catalysis for Sustainable Environment

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0042T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-III

Course Objectives:

The objectives of the course are to make the students learn about:

- To Understand Principle And Concepts Of Green Chemistry.
- To Understand The Types Of Catalysis And Industrial Applications.
- To Apply Green Solvents In Chemical Synthesis.
- To Enumerate Different Sourced Of Green Energy.
- To Apply Alternative Greener Methods For Chemical Reactions

Syllabus	Total Hours: 48Hrs
Unit-I Principles and Concepts of Green Chemistry	10Hrs
Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste – problems and Prevention: Design for degradation, Polymer recycling	
Unit-II Catalysis and Green Chemistry	9Hrs
Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo-catalysis with examples.	
Unit -III Green Solvents in Chemical Synthesis	10Hrs
Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbondioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recycling of green solvents.	
Unit -IV Emerging Greener Technologies	10Hrs
Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock's, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.	
Unit -V Alternative Greener Methods	9Hrs
Photochemical Reactions – Examples, Advantages and Challenges, Photoredox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.	

Course Outcomes(CO):

After the completion of the course students will able to:

- Apply the Green chemistry Principles for day to day life as well as synthesis, describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling.
- Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis
- Demonstrate Green solvents and importance, Discuss Supercritical carbondioxide, Explain Supercritical water, recycling of green solvents.
- Describe importance of Biomass and Solar Power, Illustrate Sonochemistry, Apply Green Chemistry for Sustainable Development; discuss the importance of Renewable resources, mechanochemical synthesis.
- Discuss Alternative green methods like Photoredox catalysis, single electron transfer reactions

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(SET), Photochemical Reactions, Microwave-assisted Reactions and Sonochemical reactions, examples and applications.

Textbooks:

1. M. Lancaster, Green Chemistry An Introductory Text, Royal Society Of Chemistry, 2002.
2. Paul T. Anastas And John C. Warner, Green Chemistry Theory And Practice, 4th Edition, Oxford University Press, Usa

Reference Books:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.
2. Edited by AlvisPerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2013.



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B.Tech. IV Year I Semester

Employability Skills

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0046T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-III

Course Objectives:

The objectives of the course are to make the students learn about:

- To encourage all round development of the students by focusing on productive skills
- To make the students aware of Goal setting and writing skills
- To enable them to know the importance of presentation skills in achieving desired goals.
- To help them develop organizational skills through group activities
- To function effectively with heterogeneous teams

Syllabus	Total Hours: 48Hrs
Unit-I Definition, importance, types of Goal Setting – SMART Goal Setting – Advantages-Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOC Analysis	10Hrs
Unit-II Definition, significance, types of writing skills – Resume writing Vs CV Writing - E-Mail writing, Cover Letters - E-Mail Etiquette -SoP (Statement of Purpose)	9Hrs
Unit -III Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation	10Hrs
Unit -IV Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation-Group Discussion-Debate –Corporate Etiquette	10Hrs
Unit -V Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success – Job searching skills - STAR method - FAQs- Answering Strategies – Mock Interviews	9Hrs

Course Outcomes(CO):

After the completion of the course students will able to:

- Understand the importance of goals and try to achieve them.
- Explain the significance of self-management.
- Apply the knowledge of writing skills in preparing eye-catching resumes.
- Analyse various forms of Presentation skills.
- Judge the group behaviour appropriately.
- Develop skills required for employability.

Textbooks:

1. Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills,2014.Cambridge Publisher.
2. Alka Wadkar. Life Skills for Success, Sage Publications, 2016.

Reference Books:

1. Gangadhar Joshi. Campus to Corporate Paperback , Sage Publications. 2015
2. Sherfield Montgomery Moody,Cornerstone Developing Soft Skills, Pearson Publications. 4 Ed. 2008
3. Shikha Kapoor. Personality Development and Soft Skills - Preparing for Tomorrow .1 Edition, Wiley, 2017.
4. M. Sen Gupta, Skills for Employability, Innovative Publication, 2019.

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5. Steve Duck and David T McMahan, The Basics of Communication Skills A Relational Perspective, Sage press, 2012.

Online Learning Resources:

- <https://youtu.be/gkLsn4ddmTs>
- <https://youtu.be/2bf9K2rRWwo>
- <https://youtu.be/FchfE3c2jzc>
- https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KIJ
- <https://www.youtube.com/c/skillopedia/videos>
- https://onlinecourses.nptel.ac.in/noc25_hs96/preview
- https://onlinecourses.nptel.ac.in/noc21_hs76/preview
- <https://archive.nptel.ac.in/courses/109/107/109107172/#>
- <https://archive.nptel.ac.in/courses/109/104/109104107/>



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B.Tech. IV Year I Semester

Electric Vehicles (Common to All Branches Except EEE)					
Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0242T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV
Course Objectives:					
The objectives of the course are to make the students learn about: <ul style="list-style-type: none"> Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs. Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics. Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems. Design and analyze the various control structures for Electric vehicle 					
Syllabus					Total Hours: 48Hrs
Unit-I	Introduction to EV Systems and Energy Sources				10Hrs
Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.					
Unit-II	EV Propulsion and Dynamics				9Hrs
Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi- motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.					
Unit -III	Fuel Cells				10Hrs
Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.					
Unit -IV	Battery Charging and Control				10Hrs
Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction. Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller's designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.					
Unit -V	Energy Storage Technologies				9Hrs
Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical- Electrical - Efficiency of energy storage systems- Super capacitors-Superconducting Magnetic Energy Storage(SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA					
Course Outcomes(CO):					
After the completion of the course students will able to: <ul style="list-style-type: none"> Understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs. Understand Various dynamics of Electric Vehicles. Understand various configurations in parameters of EV system and dynamic aspects of EV. 					

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- Analyze fuel cell technologies in EV and HEV systems.
- Analyze the battery charging and controls required of EVs.

Textbooks:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001, 1st Edition
2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2017, 1st Edition

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt, Energy Storage in Power Systems, Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016, 1st Edition
3. A.G. Ter-Gazarian, —Energy Storage for Power Systems, the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, —Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004, 1st Edition
5. James Larminie, John Lowry, —Electric Vehicle Technology Explained, Wiley, 2003, 2nd Edition.

Online Learning Resources:

1. <https://nptel.ac.in/courses/108/102/108102121/>
2. <https://nptel.ac.in/syllabus/108103009>



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B.Tech. IV Year I Semester

Total Quality Management					
CSE, CSE-AIML, CSE-CS, CSE-DS, CE, EEE					
Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0335T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-IV
Course Objectives:					
<ul style="list-style-type: none"> Familiarize the basic concepts of Total Quality Management. Expose with various quality issues in Inspection. Gain Knowledge on quality control and its applications to real time. Understand the extent of customer satisfaction by the application of various quality concepts. Demonstrate the importance of Quality standards in Production. 					
Syllabus				Total Hours:48	
Unit-I	Introduction			8Hrs	
Introduction: Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management					
Unit-II	Historical Review			10Hrs	
Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies					
Unit-III	TQM Principles			10Hrs	
TQM Principles: Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures Basic Concepts, Strategy, Performance Measure Case studies.					
Unit-IV	TQM Tools			10Hrs	
TQM Tools: Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.					
Unit-V	Quality Systems			10Hrs	
Quality Systems: Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies					
Course Outcomes(CO):					
On completion of this course, student will be able to					
<ol style="list-style-type: none"> Define and develop on quality Management philosophies and analyze quality costs frameworks. Understanding of the historical development of Total Quality Management (TQM), implementation, and real-world applications through case studies. Evaluate the cost of poor quality, process effectiveness and efficiency to analyze areas for improvement. Apply benchmarking and business process reengineering to improve management processes. Demonstrate the set of indications to evaluate performance excellence of an organization. 					

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**Text Books:**

1. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2015.
2. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005.
3. Joel E. Ross, Total Quality Management, Third Edition, CRC Press, 2017.

Reference Books:

1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.
2. Robert L. Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.
3. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015
4. Samuel Ho, TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995

Online Learning Resources:

1. <https://www.youtube.com/watch?v=VD6tXadibk0>
2. <https://www.investopedia.com/terms/t/total-quality-management-tqm.asp>
3. <https://blog.capterra.com/what-is-total-quality-management/>
4. <https://nptel.ac.in/courses/110/104/110104080/>
5. https://onlinecourses.nptel.ac.in/noc21_mg03/preview
6. <https://nptel.ac.in/courses/110/104/110104085/>
7. <https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/>



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B.Tech. IV Year I Semester

TRANSDUCERS AND SENSORS (Common To All Branches Except ECE)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0444T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of the course are to make the students learn about:

- To understand characteristics of Instrumentation System and the operating principle of motion transducers.
- To explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
- To provide knowledge on flow transducers and their applications.
- To study the working principles of pressure transducers.
- To introduce working principle and applications of force and sound transducers.

Syllabus	Total Hours: 48Hrs
Unit-I	10Hrs

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

Unit-II	9Hrs
Temperature Transducers	

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics. Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

Unit -III	10Hrs
Flow Transducers	

Flow Transducers: Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

Unit -IV	10Hrs
Pressure Transducers	

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement

Unit -V	9Hrs
Force and Sound Transducers	

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone. Inductive sensor, Capacitive sensors, Thermal sensors.

Course Outcomes(CO):

After the completion of the course students will able to:

- Understand characteristics of Instrumentation System and the operating principle of motion transducers.
- Explore working principles, and applications of different temperature transducers
- Gain knowledge on flow transducers and their applications.
- Learn the working principles of pressure transducers.
- Understand the working principle and applications of force and sound transducers.
- Explore working principles, and applications of Piezo-electric sensors.

Textbooks:

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1. A.K. Sawhney, —A course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai & Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, —Instrumentation Devices and Systems, TATA McGraw Hill publications, 2007.

Reference Books:

1. Doebelin. E.O, —Measurement Systems Application and Design, McGraw Hill International, New York, 2004.
2. Nakra B.C and Chaudhary K.K, —Instrumentation Measurement and Analysis, Second Edition, Tata McGraw-Hill Publication Ltd. 2006.



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B.Tech. IV Year I Semester

COMPUTER NETWORKS & INTERNET PROTOCOLS

(Common to all branches except CSE aligned)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0520T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of the course are to make the students learn about:

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Syllabus		Total Hours: 48Hrs
Unit-I	Computer Networks and the Internet	10Hrs
What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission (Textbook 1)		
Unit-II	The Data Link Layer, Access Networks, and LANs	9Hrs
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)		
Unit -III	The Network Layer	10Hrs
Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1).		
Unit -IV	The Transport Layer	10Hrs
Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1).		
Unit -V	The Application Layer	9Hrs
Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2).		

Course Outcomes(CO):

After the completion of the course students will able to:

- Identify the software and hardware components of a computer network
- Design software for a computer network
- Develop new routing, and congestion control algorithms
- Assess critically the existing routing protocols
- Explain the functionality of each layer of a computer network
- Choose the appropriate transport protocol based on the application requirements

Textbooks:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, —Computer Networking: A Top-Down Approach, 6th edition, Pearson, 2019.

Reference Books:

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1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, —Networks for Computer Scientists and Engineers, Oxford Publishers, 2016.

Web References:

1. <https://nptel.ac.in/courses/106105183/25>
2. <http://www.nptelvideos.in/2012/11/computer-networks.html>
3. <https://nptel.ac.in/courses/106105183/3>



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B.Tech. IV Year I Semester

INTERNET OF THINGS

(Common to all branches except CSE aligned)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0450T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of the course are to make the students learn about:

- Understand the basics of Internet of Things and protocols.
- Discuss the requirement of IoT technology
- Introduce some of the application areas where IoT can be applied.
- Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

Syllabus	Total Hours: 48Hrs
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Unit-I	Introduction to IoT	10Hrs
Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates.		

Unit-II	Prototyping IoT Objects using Microprocessor/Microcontroller	9Hrs
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Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

Unit -III	IoT Architecture and Protocols	10Hrs
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Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

Unit -IV	Device Discovery and Cloud Services for IoT	10Hrs
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Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

Unit -V	UAV IoT	9Hrs
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Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

Course Outcomes(CO):

After the completion of the course students will able to:

- Understand general concepts of Internet of Things.
- Apply design concept to IoT solutions
- Analyze various M2M and IoT architectures
- Evaluate design issues in IoT applications
- Create IoT solutions using sensors, actuators and Devices

Textbooks:

1. Vijay Madiseti and Arshdeep Bahga, — Internet of Things (A Hands-on-Approach)l, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsevanos, New York, Springer, Boston, Massachusetts : Credo Reference, 2014. 2016.

Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of

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- Intelligencell, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madiseti – Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, —Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Apress Publications, 2013
5. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 9781- 4493-9357-
6. DGCA RPAS Guidance Manual, Revision 3 – 2020
7. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

Web References:

1. <https://www.arduino.cc/>
2. <https://www.raspberrypi.org/>
3. <https://nptel.ac.in/courses/106105166/5>
4. <https://nptel.ac.in/courses/108108098/4>



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B.Tech. IV Year I Semester

INTRODUCTION TO QUANTUM COMPUTING

(Common to all branches except CSE aligned)

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A3315Ta	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of the course are to make the students learn about:

- To introduce the principles and mathematical foundations of quantum computation.
- To understand quantum gates, circuits, and computation models.
- To explore quantum algorithms and their advantages over classical ones.
- To develop the ability to simulate and write basic quantum programs.
- To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

Syllabus	Total Hours: 48Hrs
Unit-I Fundamentals of Quantum Mechanics and Linear Algebra Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.	10Hrs
Unit-II Quantum Gates and Circuits Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.	9Hrs
Unit -III Quantum Algorithms and Complexity Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover's Search Algorithm, Shor's Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA	10Hrs
Unit -IV Quantum Programming and Simulation Platforms Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware	10Hrs
Unit -V Applications and Future of Quantum Computing Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.	9Hrs

Course Outcomes(CO):

After the completion of the course students will able to:

- Explain the fundamental concepts of quantum mechanics used in computing.
- Construct and analyze quantum circuits using standard gates.
- Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.
- Develop simple quantum programs using Qiskit or similar platforms.
- Analyze applications and challenges of quantum computing in real-world domains.

Textbooks:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

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**Reference Books:**

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.

Web References:

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. edX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum



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B.Tech. IV Year I Semester

FINANCIAL MATHEMATICS

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0032T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of the course are to make the students learn about:

- To provide mathematical foundations for financial modelling, risk assessment and asset pricing.
- To introduce stochastic models and their applications in pricing derivatives and interest rate modelling.
- To develop analytical skills for fixed-income securities, credit risk, and investment strategies.
- To equip students with computational techniques for pricing financial derivatives.

Syllabus		Total Hours: 40Hrs
Unit-I	Asset Pricing and Risk Management	8Hrs
Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis.		
Unit-II	Stochastic Models in Finance	8Hrs
Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito's Lemma, Ito Integral, and Ito Isometry.		
Unit -III	Interest Rate and Credit Modelling	8Hrs
Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.		
Unit -IV	Fixed-Income Securities and Bond Pricing	8Hrs
Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage Backed Securities.		
Unit -V	Exotic Options and Computational Finance	8Hrs
Stochastic volatility models and the Feynman-Kac theorem. Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.		

Course Outcomes(CO):

After the completion of the course students will able to:

- Explain fundamental financial concepts, including arbitrage, valuation, and risk.
- Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts.
- Analyze mathematical techniques for pricing options and financial derivatives.
- Evaluate interest rate models and bond pricing methodologies.
- Utilize computational techniques such as Monte Carlo simulations for financial modelling.

Textbooks:

1. Ales Cerny, *Mathematical Techniques in Finance: Tools for Incomplete Markets*, Princeton University Press.
2. S.R. Pliska, *Introduction to Mathematical Finance: Discrete-Time Models*, Cambridge University Press.

Reference Books:



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1. Ioannis Karatzas & Steven E. Shreve, Methods of Mathematical Finance, Springer, New York.
2. John C. Hull, Options, Futures, and Other Derivatives, Pearson.

Web References:

1. MIT – Mathematics for Machine Learning <https://ocw.mit.edu>
2. Coursera – Financial Engineering and Risk Management (Columbia University)
<https://www.coursera.org/>
3. National Stock Exchange (NSE) India – Financial Derivatives <https://www.nseindia.com/>



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B.Tech. IV Year I Semester

SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0038T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of the course are to make the students learn about:

- To provide exposure to various kinds of sensors and actuators and their engineering applications.
- To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
- To explain the operating principles of various sensors and actuators
- To educate the fabrication of sensors
- To explain the required sensor and actuator for interdisciplinary application

Syllabus		Total Hours: 40Hrs
Unit-I	Introduction to Sensors and Actuators	8Hrs
Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching. Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.		
Unit-II	Temperature and Mechanical Sensors	8Hrs
Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).		
Unit -III	Optical and Acoustic Sensors	8Hrs
Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones		
Unit -IV	Magnetic and Electromagnetic Sensors	8Hrs
Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.		
Unit -V	Chemical and Radiation Sensors	8Hrs
Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors. Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)		

Course Outcomes(CO):

After the completion of the course students will able to:

- Classify different types of Sensors and Actuators along with their characteristics
- Summarize various types of Temperature and Mechanical sensors
- Illustrates various types of optical and mechanical sensors
- Analyze various types of Optical and Acoustic Sensors
- Interpret the importance of smart materials in various devices

Textbooks:

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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.



1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

Web References:

1. NPTEL course link: https://onlinecourses.nptel.ac.in/noc21_ee32/preview



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B.Tech. IV Year I Semester

CHEMISTRY OF NANOMATERIALS AND APPLICATIONS

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0043T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of the course are to make the students learn about:

- To understand basics and characterization of nanomaterials.
- To understand synthetic methods of nanomaterials.
- To apply various techniques for characterization of nanomaterials.
- To understand Studies of Nano-structured Materials
- To enumerate the applications of advanced nanomaterials in engineering

Syllabus		Total Hours: 40Hrs
Unit-I	Basics and Characterization of Nanomaterials	8Hrs
Basics and Characterization of Nanomaterials: Introduction, Scope of nanoscience and nanotechnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.		
Unit-II	Synthesis of nanomaterials	8Hrs
Synthesis of nanomaterials : Top-Down approach, Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, highenergy ball milling method. Synthetic Methods: Bottom-Up approach, Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.		
Unit -III	Techniques for characterization	8Hrs
Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.		
Unit -IV	Studies of Nano-structured Materials	8Hrs
Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.		
Unit -V	Advanced Engineering Applications of Nanomaterials	8Hrs
Advanced Engineering Applications of Nanomaterials: Applications of Nano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.		

Course Outcomes(CO):

After the completion of the course students will able to:

- Classify the nanostructure materials; describe scope of nanoscience and importance technology.
- Describe the top-down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapor deposition method and electrode position method, Discuss about highenergy ball milling.
- Discuss different technique for characterization of nanomaterial, Explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis.
- Explain synthesis and properties and applications of nanomaterials, Discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, nonlinear optical materials.
- Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical

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domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

Textbooks:

1. NANO: The Essentials: T Pradeep, McGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012.

Reference Books:

1. Concepts of Nanochemistry; LudovicoCademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures & Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.



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B.Tech. IV Year I Semester

LITERARY VIBES

Course Code	L:T:P	Credits	Exam marks	Exam Duration	Course Type
23A0047T	3:0:0	3	CIE:30 & SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of the course are to make the students learn about:

- To inculcate passion for aesthetic sense and reading skills
- To encourage respecting others' experiences and creative writing
- To explore emotions, communication skills and critical thinking
- To educate how books serve as the reflection of history and society
- To provide practical wisdom and duty of responding to events of the times

Syllabus		Total Hours: 40Hrs
Unit-I	Poetry	8Hrs
1. Ulysses- Alfred Lord Tennyson 2. Ain't I woman?-Sojourner Truth 3. The Second Coming-W.B. Yeats 4. Where the Mind is Without Fear-Rabindranath Tagore		
Unit-II	Drama: <i>Twelfth Night</i>- William Shakespeare	8Hrs
1. Shakespeare -life and works 1. Plot & sub-plot and Historical background of the play 2. Themes and Criticism 3. Style and literary elements 4. Characters and characterization		
Unit -III	Short Story	8Hrs
1. The Luncheon - Somerset Maugham 2. The Happy Prince-Oscar Wild 3. Three Questions – Leo Tolstoy 4. Grief –Antony Chekov		
Unit -IV	Prose: Essay and Autobiography	8Hrs
1. My struggle for an Education-Booker T Washington 2. The Essentials of Education-Richard Livingston 3. The story of My Life-Helen Keller 4. Student Mobs-JB Priestly		
Unit -V	Novel: <i>Hard Times</i>- Charles Dickens	8Hrs
1. Charles Dickens-Life and works 2. Plot and Historical background of the novel 3. Themes and criticism 4. Style and literary elements 5. Characters and characterization		

Course Outcomes(CO):

After the completion of the course students will able to:

- Identify genres, literary techniques and creative uses of language in literary texts.
- Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces
- Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments
- Analyze the underlying meanings of the text by using the elements of literary texts L4



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- Evaluate their own work and that of others critically
- Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance

Textbooks:

1. Charles Dickens.Hard Times.(Sangam Abridged Texts) Vantage Press, 1983
2. DENT JC.William Shakespeare. Twelfth Night. Oxford University Press,2016.

Reference Books:

1. WJ Long.History of English Literature, Rupa Publications India; First Edition (4 October 2015)
2. RK Kaushik And SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University Press .2018.
3. Dhanvel, SP. English and Soft Skills, Orient Blackswan,2017.
4. New Horizon, Pearson publications, New Delhi 2014
5. Vimala Ramarao, Explorations Volume-II, Prasaranga Bangalore University,2014.
6. Dev Neira, Anjana & Co. Creative Writing: A Beginner's Manual.Pearson India, 2008.

Online Resources

- <https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses>
- <https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis>
- https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette
- <https://sirjutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/>
- <https://www.litcharts.com/lit/twelfth-night/themes>
- <https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony/>

Member Secretary

Head of the Department,
Dept. of Civil Engineering
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CE-HOD



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B.Tech. IV Year II Semester

SL. No	Category	Course Code	Title	Hours per week			Total Credits
				L	T	P	
1	Major Project	23A0147P	Internship	-	-	-	4
			Project	-	-	-	8
Total							12

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Open Elective courses offered by CE Dep

Year-Sem	Course code	Open Elective
III-I (OE-I)	23A0148T	Green Buildings
	23A0149T	Construction Technology and Management
III-II (OE-II)	23A0150T	Disaster Management
	23A0151T	Sustainability in Engineering Practices
IV-I (OE-III)	23A0152T	Building Materials and Services
	23A0121T	Environmental Impact Assessment
IV-I (OE-IV)	23A0153T	Geo-Spatial Technologies
	23A0154T	Solid Waste Management

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B.Tech. III Year I Semester

GREEN BUILDINGS (CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0148T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives:

The objectives of this course are to make the student to:

1. To understand the fundamental concepts of green buildings, their necessity, and sustainable features.
2. To Analyse green building concepts, rating systems, and their benefits in India.
3. To apply green building design principles, energy efficiency measures, and renewable energy sources.
4. To evaluate air conditioning systems, HVAC designs, and energy modeling for sustainable buildings.
5. To assess material conservation strategies, waste management, and indoor environmental quality in green buildings.

Syllabus	Total Hours: 48
Unit-I	Introduction to Green Building 8Hrs
Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing A Green Building, Important Sustainable Features for Green Buildings.	
Unit-II	Green Building Concepts and Practices 10Hrs
Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED India Rating System, and Energy Efficiency.	
Unit-III	Green Building Design 10Hrs
Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.	
Unit-IV	Air Conditioning 10Hrs
Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.	
Unit-V	Material Conservation 10Hrs
Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.	
Text Books:	
<ol style="list-style-type: none"> 1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009. 2. Green Building Hand Book by tom woolley and Sam kimings, 2009. 	
Reference Books:	
<ol style="list-style-type: none"> 1. Complete Guide to Green Buildings by Trish riley 	



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2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code –ECBC-2020, published by BEE

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/102/105102195/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand the importance of green buildings, their necessity, and sustainable features.	L2
CO2	Analyse various green building practices, rating systems, and their impact on environmental sustainability.	L4
CO3	Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.	L3
CO4	Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.	L5
CO5	Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	2	3	-	-	-	-	-	3	3
CO2	-	3	-	-	2	-	3	-	-	-	-	2	3	3
CO3	-	-	3	3	3	-	3	-	-	-	-	-	3	3
CO4	-	-	-	-	3	-	3	-	-	-	-	-	3	3
CO5	-	-	-	-	-	3	3	3	2	-	-	-	-	3



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B.Tech. III Year I Semester

CONSTRUCTION TECHNOLOGY AND MANAGEMENT

(CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0149T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-I

Course Objectives:

The objectives of this course are to make the student to:

1. To understand project management fundamentals, organizational structures, and leadership principles in construction.
2. To Analyse manpower planning, equipment management, and cost estimation in civil engineering projects.
3. To apply planning, scheduling, and project management techniques such as CPM and PERT.
4. To evaluate various contract types, contract formation, and legal aspects in construction management.
5. To assess safety management practices, accident prevention strategies, and quality management systems in construction.

Syllabus

Total Hours: 48

Unit-I

Introduction to Project Management

8Hrs

Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.

Unit-II

Planning of Man power and Machine

10Hrs

Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.

Unit-III

Planning, Scheduling and Project Management

10Hrs

Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network- formulation and Time Computation.

Unit-IV

Contracts

10Hrs

Types of Contracts, formation of Contract – Contract Conditions – Contract for Labour, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.

Unit-V

Safety Management

10Hrs

Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics.

Text Books:

1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016.
2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019
3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd.

Reference Books:



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1. Brien, J.O. and Plotnick, F.L., CPM in Construction Management, McGraw Hill, 2010.
2. Punmia, B.C., and Khandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.
3. Construction Methods and Management: Pearson New International Edition 8 th Edition Stephens Nunnally.
4. Rhoden, M and Cato B, Construction Management and Organisational Behaviour, Wiley-Blackwell, 2016

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/104/105104161/>

<https://archive.nptel.ac.in/courses/105/103/105103093/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand (Cos) project management fundamentals, organizational structures, and leadership principles in construction.	L2
CO2	Analyse manpower planning, equipment management, and cost estimation in civil engineering projects.	L4
CO3	Apply planning, scheduling, and project management techniques such as CPM and PERT.	L3
CO4	Evaluate various contract types, contract formation, and legal aspects in construction management.	L5
CO5	Assess safety management practices, accident prevention strategies, and quality management systems in construction.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	2	-	2	2	-	-	-	3	3
CO2	-	3	-	-	2	-	-	-	-	-	-	2	3	3
CO3	-	-	3	3	3	-	-	-	-	2	-	-	3	3
CO4	-	-	3	3	3	-	-	2	-	-	-	-	3	3
CO5	-	-	-	-	-	3	3	3	2	-	-	-	-	3



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B.Tech. III Year II Semester

DISASTER MANAGEMENT (CSE, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0150T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-II

Course Objectives:

The objectives of this course are to make the student to:

1. To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. To Analyse the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. To apply wind engineering principles and computational techniques in designing wind-resistant structures.
4. To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

Syllabus		Total Hours: 48
Unit-I	Introduction to Natural Disasters	8Hrs
Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).		
Unit-II	Cyclones and Their Impact	10Hrs
Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.		
Unit-III	Wind Engineering and Structural Response	10Hrs
Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas.		
Unit-IV	Seismology and Earthquake Effects	10Hrs
Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening.		
Unit-V	Planning and Design Considerations for Seismic Safety	10Hrs
General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and		



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Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques.

Text Books:

1. David Alexander, Natural Disasters, 1st Edition, CRC Press, 2017.
2. Edward A. Keller and Duane E. De Vecchio, Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 5th Edition, Routledge, 2019.

Reference Books:

1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.
3. Bimal Kanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020.

Online Learning Resources:

<https://nptel.ac.in/courses/124107010>

https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.	L2
CO2	Analyse the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.	L4
CO3	Apply wind engineering principles and computational techniques in designing wind-resistant structures.	L3
CO4	Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.	L5
CO5	Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	2	-	2	2	-	-	-	3	3
CO2	-	3	-	-	2	-	-	-	-	-	-	2	3	-
CO3	3	-	-	3	-	-	3	-	-	2	-	-	-	3
CO4	-	-	3	-	3	-	-	2	-	-	-	-	3	-
CO5	-	-	-	3	-	3	3	3	2	-	-	-	-	3



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B.Tech. III Year II Semester

SUSTAINABILITY IN ENGINEERING PRACTICES (CSE, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0151T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-II

Course Objectives:

The objectives of this course are to make the student to:

1. To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. To Analyse sustainable construction materials, their durability, and life cycle assessment.
3. To apply energy calculations in construction materials and assess their embodied energy.
4. To evaluate green building standards, energy codes, and performance ratings.
5. To assess the environmental effects of energy use, climate change, and global warming.

Syllabus	Total Hours: 48
Unit-I	INTRODUCTION 8Hrs
Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO ₂ Contribution From Cement and Other Construction Materials.	
Unit-II	MATERIALS USED in SUSTAINABLE CONSTRUCTION 10Hrs
Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.	
Unit-III	ENERGY CALCULATIONS 10Hrs
Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use	
Unit-IV	GREEN BUILDINGS 10Hrs
Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings – Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building	
Unit-V	ENVIRONMENTAL EFFECTS 10Hrs
Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.	

Text Books:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2016.

Reference Books:

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd. 2012.



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Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/105/105105157/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.	L2
CO2	Analyse sustainable construction materials, their durability, and life cycle assessment.	L4
CO3	Apply energy calculations in construction materials and assess their embodied energy.	L3
CO4	Evaluate green building standards, energy codes, and performance ratings.	L5
CO5	Assess the environmental effects of energy use, climate change, and global warming.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	2	3	2	-	-	-	-	3	3
CO2	-	3	-	-	2	-	3	-	-	-	-	2	3	3
CO3	-	-	3	3	3	-	2	-	-	2	-	-	3	3
CO4	-	-	3	3	3	-	3	2	-	-	-	-	3	3
CO5	-	-	-	-	-	3	3	3	-	-	-	-	-	3



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B.Tech. IV Year I Semester

BUILDING MATERIALS AND SERVICES (CSE, AI&ML, CS, DS,ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0152T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-III

Course Objectives:

The objectives of this course are to make the student to:

1. To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. To Analyse the composition, manufacturing process, and properties of cement and admixtures.
3. To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. To evaluate masonry, mortars, finishing techniques, and formwork systems.
5. To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

Syllabus	Total Hours: 48
Unit-I	Stones and Bricks, Tiles 8Hrs
Building Stones – Classifications and Quarrying – Properties – Structural Requirements – Dressing. Bricks – Composition of Brick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, Paints and Plastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fibre – Reinforced Glass Bricks, Steel & Aluminum, Plastics.	
Unit-II	Cement & Admixtures 10Hrs
Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency – Initial & Final Setting – Soundness. Admixtures – Mineral & Chemical Admixtures – Uses	
Unit-III	Building Components 10Hrs
Lintels, Arches, Walls, Vaults – Stair Cases – Types of Floors, Types of Roofs – Flat, Curved, Trussed; Foundations – Types; Damp Proof Course; Joinery – Doors – Windows – Materials – Types.	
Unit-IV	Mortars, Masonry and Finishing's Mortars 10Hrs
Lime and Cement Mortars Brick Masonry – Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP. form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.	
Unit-V	Building Services 10Hrs
Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials and Types; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire Resistant Materials and Constructions.	
Text Books:	
<ol style="list-style-type: none"> 1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications. 2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015. 	
Reference Books:	



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1. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delhi
2. P. C. Varghese, Building Materials, Prentice Hall of India, 2015.
3. N. Subramanian, Building Materials Testing and Sustainability, Oxford Higher Education, 2019.
4. R. Chudley, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/102/105102088/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.	L2
CO2	Analyse the composition, manufacturing process, and properties of cement and admixtures.	L4
CO3	Apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.	L3
CO4	Evaluate masonry, mortars, finishing techniques, and formwork systems.	L5
CO5	Assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	2	-	-	-	-	-	-	-	3	3
CO2	3	3	-	-	2	-	-	-	-	-	-	-	3	3
CO3	3	-	3	2	3	-	-	-	-	-	-	-	3	3
CO4	-	-	3	3	3	-	2	-	-	-	-	-	3	3
CO5	-	-	-	-	-	3	3	2	-	-	-	-	-	3



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B.Tech. IV Year I Semester

ENVIRONMENTAL IMPACT ASSESSMENT (CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0121T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-III

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
2. Analyse the impact of developmental activities on land use, soil, and water resources.
3. Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
4. Develop environmental audit procedures and assess compliance with environmental regulations.
5. Understand and apply environmental acts, notifications, and legal frame works in EIA studies.

Syllabus		Total Hours: 48
Unit-I	Concepts and methodologies of EIA	8Hrs
Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.		
Unit-II	Impact of Developmental Activities and Land Use	10Hrs
Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I A in Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts On Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.		
Unit-III	Assessment of Impact On Vegetation, Wildlife and Risk Assessment	10Hrs
Introduction - Assessment of Impact of Development Activities On Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing An Environmental Risk Assessment- Advantages of Environmental Risk Assessment.		
Unit-IV	Environmental Audit	10Hrs
Introduction - Environmental Audit & Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report		
Unit-V	Environmental Acts and Notifications	10Hrs
The Environmental Protection Act, The Water Preservation Act, The Air (Prevention & Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000.		

Text Books:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd



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edition 2011

2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

Reference Books:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G. Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania & Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Online Learning Resources:

<https://archive.nptel.ac.in/courses/124/107/124107160/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Apply various methodologies for conducting Environmental Impact Assessments.	L3
CO2	Analyse the impact of land-use changes on soil, water, and air quality.	L4
CO3	Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.	L5
CO4	Develop environmental audit reports and assess compliance with environmental policies.	L6
CO5	Interpret and apply environmental acts and regulations related to EIA.	L2

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	3	-	-	-	-	-	1	2	2
CO2	3	3	3	2	2	3	-	-	-	-	-	1	3	2
CO3	3	3	3	2	2	3	3	-	-	-	-	1	3	3
CO4	3	3	3	3	2	3	3	-	-	-	-	1	3	3
CO5	2	2	2	2	2	3	3	3	-	-	-	1	2	2



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B.Tech. IV Year I Semester

GEO-SPATIAL TECHNOLOGIES (CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0153T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-IV

Course Objectives:

The objectives of this course are to make the student to:

1. To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. To Analyse vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. To evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. To assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

Syllabus		Total Hours: 48
Unit-I	Raster Analysis	8Hrs
Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path.		
Unit-II	Vector Analysis	10Hrs
Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co-Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering		
Unit-III	Network Analysis	10Hrs
Network – Introduction - Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path in A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis		
Unit-IV	Surface And Geostatistical Analysis	10Hrs
Surface Data – Sources of X,Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.		
Unit-V	Customization, Web GIS, Mobile Mapping	10Hrs
Customization of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications- Location Based Services: Emergency and Business Solutions - Big Data Analytics.		

Text Books:

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
2. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.



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website: gist.edu.in / e-mail: geethanjali@gist.edu.in.



Reference Books:

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley, 2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, —An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub., 2008

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/105/105105202/>
https://onlinecourses.nptel.ac.in/noc19_cs76/preview

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.	L2
CO2	Analyse vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.	L4
CO3	Apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.	L3
CO4	Evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.	L5
CO5	Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	2	-	-	-	-	-	-	-	3	3
CO2	3	3	-	-	2	-	-	-	-	-	-	2	3	3
CO3	3	-	3	2	3	-	-	-	-	-	-	-	3	3
CO4	-	-	3	3	3	-	2	-	-	-	-	-	3	3
CO5	-	-	-	-	3	3	3	2	-	-	-	-	3	3



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B.Tech. IV Year I Semester

SOLID WASTE MANAGEMENT (CSE, AI&ML, CS, DS, ECE, EEE, ME)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0154T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	OE-IV
Course Objectives:					
The objectives of this course are to make the student to:					
<ol style="list-style-type: none"> To understand the types, sources, and characteristics of solid waste, along with regulatory frameworks. To Analyse engineering systems for solid waste collection, storage, and transportation. To apply resource and energy recovery techniques for sustainable solid waste management. To evaluate landfill design, construction, and environmental impact mitigation strategies. To assess hazardous waste management techniques, including biomedical and e-waste disposal. 					
Syllabus					Total Hours: 48
Unit-I	Solid Waste				8Hrs
Definitions, Types of Solid Wastes, Sources of Solid Wastes, Characteristics, and Perspectives; Properties of Solid Wastes, Sampling of Solid Wastes, Elements of Solid Waste Management - Integrated Solid Waste Management, Solid Waste Management Rules 2016.					
Unit-II	Engineering Systems for Solid Waste Management				10Hrs
Solid Waste Generation; On-Site Handling, Storage and Processing; Collection of Solid Wastes; Stationary Container System and Hauled Container Systems – Route Planning - Transfer and Transport; Processing Techniques;					
Unit-III	Engineering Systems for Resource and Energy Recovery				10Hrs
Processing Techniques; Materials Recovery Systems; Recovery of Biological Conversion Products – Composting, Pre and Post Processing, Types of Composting, Critical Parameters, Problems With Composing - Recovery of Thermal Conversion Products; Pyrolysis, Gasification, RDF - Recovery of Energy From Conversion Products; Materials and Energy Recovery Systems.					
Unit-IV	Landfills				10Hrs
Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills – Types of Liners – Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation.					
Unit-V	Hazardous Waste Management				10Hrs
Sources and Characteristics, Effects On Environment, Risk Assessment – Disposal of Hazardous Wastes – Secured Landfills, Incineration - Monitoring – Biomedical Waste Disposal, E-Waste Management, Nuclear Wastes, Industrial Waste Management					
Text Books:					
<ol style="list-style-type: none"> Tchobanoglous G, Theisen H and Vigil SA, 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002. 					



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Reference Books:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/103/105103205/>
<https://archive.nptel.ac.in/courses/120/108/120108005/>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand the types, sources, and characteristics of solid waste, along with Regulatory frameworks.	L2
CO2	Analyze engineering systems for solid waste collection, storage, and transportation.	L4
CO3	Apply resource and energy recovery techniques for sustainable solid waste Management..	L3
CO4	Evaluate landfill design, construction, and environmental impact mitigation strategies	L5
CO5	Assess hazardous waste management techniques, including biomedical and e-waste.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	2	-	-	-	-	-	-	-	3	3
CO2	3	3	-	-	2	-	-	-	-	-	-	2	3	3
CO3	3	-	3	2	3	-	-	-	-	-	-	-	3	3
CO4	-	-	3	3	3	-	2	-	-	-	-	-	3	3
CO5	-	-	-	-	3	3	3	2	-	-	-	-	3	3

Member Secretary

Head of the Department,
Dept. of Civil Engineering
GEETHANJALI INSTITUTE OF
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CE-HOD



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COURSES OFFERED FOR HONORS DEGREE IN CIVIL ENGINEERING

S.No	Course Code	Course Title	Contact Hours per week			Credits
			L	T	P	
1	23A0155T	Soil Dynamics and Machine Foundation	3	0	0	3
2	23A0156T	Industrial Waste and Waste Water Management	3	0	0	3
3	23A0157T	Repair & Rehabilitation of Structures	3	0	0	3
4	23A0158T	Design and Drawing of Irrigation Structures	3	0	0	3
5	23A0159T	Road Safety Engineering	3	0	0	3
6	23A0160P	NDT Lab	0	0	3	1.5
7	23A0161P	ETABS/SAP Lab	0	0	3	1.5
Total						18

Member Secretary

Head of the Department,
Dept. of Civil Engineering
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CE-HOD



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HONORS DEGREE IN CIVIL ENGINEERING

SOIL DYNAMICS AND MACHINE FOUNDATION

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0155T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HONOR

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamentals of vibration and response of single/multiple-degree-of-freedom systems. (L3)
2. Analyze the wave propagation in soil deposits and evaluate dynamic soil properties. (L4)
3. Perform vibration analyses for machine foundations, considering different loading conditions. (L4)
4. Design block foundations for reciprocating and impact machines based on codal provisions. (L5)
5. Analyze and design machine foundations on piles, considering different modes of vibration. (L5)

Syllabus		Total Hours: 48
Unit-I	Fundamentals Of Vibration	8Hrs
Definitions, Simple Harmonic Motion, Response Of SDOF Systems Of Free And Forced Vibrations With And Without Viscous Damping, Frequency Dependent Excitation, Systems Under Transient Loads, Rayleigh's Method Of Fundamental Frequency, Logarithmic Decrement, Determination Of Viscous Damping, Transmissibility, Systems With Two And Multiple Degrees Of Freedom, Vibration Measuring Instruments		
Unit-II	Wave Propagation and Dynamic Soil Properties	10Hrs
Propagation of seismic waves in soil deposits - Attenuation of stress waves, Stress-strain behaviour of cyclically loaded soils, Strength of cyclically loaded soils, Dynamic soil properties - Laboratory and field testing techniques, Elastic constants of soils, Correlations for shear modulus and damping ratio in sand, gravels, clays and lightly cemented sand. Liquefaction of soils: An introduction and evaluation using simple methods.		
Unit-III	Vibration Analyses	10Hrs
Types, General Requirements, Permissible amplitude, Allowable soil pressure, Modes of vibration of a rigid foundation block, Methods of analysis, Lumped Mass models, elastic half space method, elasto-dynamics, effect of footing shape on vibratory response, dynamic response of embedded block foundation, Vibration isolation		
Unit-IV	Design of Machine Foundations	10Hrs
Analysis and design of block foundations for reciprocating engines, Dynamic analysis and design procedure for a hammer foundation, IS code of practice design procedure for foundations of reciprocating and impact type machines. Vibration isolation and absorption techniques		
Unit-V	Machine Foundations on Piles	10Hrs
Introduction, Analysis of piles under vertical vibrations, Analysis of piles under translation and rocking, Analysis of piles under torsion, Design procedure for a pile supported machine foundation.		

Text Books:

1. S. Prakash, Soil Dynamics, McGraw Hill, 1st Edition, 1981.
2. F. E. Richart, J. R. Hall, and R. D. Woods, Vibrations of Soils and Foundations, Prentice Hall Inc., 1st Edition, 1970.



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Reference Books:

1. I. Chowdhary and S. P. Dasgupta, Dynamics of Structures and Foundation, 1st Edition, 2009.
2. S. D. Arya, M. O'Neil, and G. Pincus, Design of Structures and Foundations for Vibrating Machines, Gulf Publishing Co., 1st Edition, 1979.
3. S. Prakash and V. K. Puri, Foundation for Machines: Analysis and Design, John Wiley & Sons, 1st Edition, 1998.
4. N. S. V. Kameswara Rao, Vibration Analysis and Foundation Dynamics, Wheeler Publishing Ltd., 1st Edition, 1998.
5. Swami Saran, Soil Dynamics and Machine Foundation, Galgotia Publishing, 1st Edition, 1999.
6. S. L. Kramer, Geotechnical Earthquake Engineering, Prentice Hall, 1st Edition, 1996.

Online Learning Resources:

<https://nptel.ac.in/courses/105101005>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the fundamentals of vibration and response of SDOF/MDOF systems.	L3
CO2	Analyze seismic wave propagation and evaluate dynamic soil properties.	L4
CO3	Perform vibration analyses of rigid foundation blocks using different models.	L4
CO4	Design machine foundations for reciprocating and impact-type machines.	L5
CO5	Analyze the response of pile-supported machine foundations and develop design solutions.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	-	-	-	-	-	-	1	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	2
CO3	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO4	3	3	3	3	2	-	-	-	-	-	-	1	3	3
CO5	2	2	2	2	2	2	-	-	-	-	-	1	2	2



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HONORS DEGREE IN CIVIL ENGINEERING

INDUSTRIAL WASTE AND WASTE WATER MANAGEMENT

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0156T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HONOR

Course Objectives:

The objectives of this course are to make the student to:

1. To understand the various sources and characteristics of industrial wastewater and its impacts on natural water bodies and sewer systems.(L2)
2. To explain and differentiate primary and preliminary treatment methods for industrial effluents.(L2)
3. To illustrate advanced treatment techniques including nutrient and heavy metal removal. (L3)
4. To examine and summarize the characteristics and treatment needs of effluents from major industries like sugar, steel, petroleum, textiles, and tanneries.(L4)
5. To develop awareness of common effluent treatment plants (CETPs), their design considerations, and operational challenges.(L5)

Syllabus		Total Hours: 48
Unit-I		8Hrs
Sources of Pollution - Physical, Chemical, Organic & Biological properties of Industrial Wastes - Difference between industrial & municipal waste waters - Sources and Flow Rates of Municipal Wastewater - Characteristics of Municipal Wastewater - Effects of industrial effluents on sewers and Natural water Bodies.		
Unit-II		10Hrs
Pre & Primary Treatment - Equalization, Proportioning, Neutralization, Oil separation by Floating-Waste Reduction-Volume Reduction-Strength Reduction. Waste Treatment Methods - Nitrification and Denitrification-Phosphorous removal -Heavy metal removal - Membrane Separation Process - Air Stripping and Absorption Processes - Special Treatment Methods - Disposal of Treated Waste Water.		
Unit-III		10Hrs
Manufacturing Process and liquid waste origin, Characteristics and Composition from Textiles, Paper and Pulp industries, Sugar Mills, Tanneries, Dairy and Oil Refineries		
Unit-IV		10Hrs
Manufacturing Process and liquid waste origin, Characteristics and Composition from Steel, Pharmaceutical Plants, Petroleum Refineries, Atomic Energy Plants and other Mineral Processing Industries		
Unit-V		10Hrs
Joint Treatment of Raw Industries waste water and Domestic Sewage – Common Effluent Treatment Plants(CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects. Development of integrated treatment for waste water – zero polluting industry concept – Reuse and recycle of waste water.		

Text Books:

1. Rao, M.N. & Dutta, A.K. —Waste Water Treatment, 3rd Edition, IBH Publishers, 2020.
2. Patwardhan-|| Industrial Waste Water Treatment||- PHI learning Pvt. Ltd, 2017



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Reference Books:

1. Metcalf, L., and Eddy, P. Wastewater Engineering; Treatment and Reuse. 5th Edition, Tata McGraw-Hill, New Delhi, 2013.
2. Arceivala, S. J. and Asolekar, S. R. Wastewater Treatment for Pollution Control. 3rd Edition, McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2006.
3. Bureau of Indian Standards for analysis of water and wastewater (IS3025)
4. Anil K. De. Environmental Chemistry, New Age International Ltd., New Delhi, 2003
5. Hammer, Mark J. Water and Wastewater Technology, Prentice Hall, New Jersey, 2001

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ce53/preview
2. https://onlinecourses.nptel.ac.in/noc21_ce25/preview

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Identify sources and characteristics of industrial wastewaters, compare them with municipal wastewaters, and explain their effects on sewers and water bodies.	L2
CO2	Apply suitable preliminary and primary treatment methods such as equalization, neutralization, and oil separation.	L3
CO3	Analyze various waste treatment methods like nitrification, phosphorous and heavy metal removal, and evaluate their suitability.	L4
CO4	Assess the composition of industrial effluents and recommend suitable treatment strategies.	L5
CO5	Design components of CETPs and address operational and maintenance problems considering economic aspects.	L6

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	2	2	-	-	-	-	1	3	2
CO2	2	3	2	2	2	-	-	-	-	-	-	-	3	2
CO3	2	3	2	3	2	-	2	-	-	-	-	1	3	3
CO4	2	3	3	3	2	-	2	-	-	-	-	1	3	3
CO5	2	2	3	2	3	2	3	-	1	2	2	1	3	3



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HONORS DEGREE IN CIVIL ENGINEERING

REPAIR & REHABILITATION OF STRUCTURES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0157T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HONOR

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the causes of deterioration and distress in concrete structures and the importance of rehabilitation. (L1)
2. Familiarize with condition/damage assessment and evaluation techniques using NDT and field/lab tests. (L2)
3. Gain knowledge on the selection and application of suitable materials and techniques for concrete repair. (L2)
4. Learn various rehabilitation and retrofitting methods including case studies and demolition techniques. (L3)
5. Understand the importance of protection, maintenance, and structural health monitoring (SHM) for ensuring long-term durability. (L1)

Syllabus		Total Hours: 48
Unit-I	Introduction	8Hrs
Deterioration of structures with aging, Need for rehabilitation - Deterioration of concrete structures: Causes of distress Causes of distress in concrete structures, construction and design failures, Distress in concrete due to physical and chemical deterioration. Deterioration due to water leakage, fire – detection & mitigation of the same. Visual deterioration of structures- Types of cracks, causes & characteristics of cracking in various structural components. Measurement of cracks as per IS456 - interpretation of the cause of particular type of crack.		
Unit-II	Conditional/damage assessment & Evaluation of structures	10Hrs
Condition assessment and distress-diagnostic techniques, Field & laboratory testing procedures for evaluating the structure for strength, corrosion activity, performance & integrity, durability by use of NDT equipments.		
Unit-III	Materials for Repair	10Hrs
Materials for Repair materials - Criteria for durable concrete repair, Methodology, selection of repair materials, Preparatory stage of repairs, Different types of repair materials & their application, types of repair techniques. Corrosion damage of reinforced concrete - repair and prevention measures - Surface deterioration, Efflorescence, causes, prevention and protection Surface coatings and painting - Water proofing		
Unit-IV	Rehabilitation methods	10Hrs
Rehabilitation methods Retrofitting, RCC Jacketing, Fibre wrapping, Building and restoration of earthquake damaged masonry structure, Method for foundation rehabilitation; Case studies - Demolition techniques : Engineered demolition techniques for Dilapidated structures – case studies.		
Unit-V	Protection & maintenance of structures	10Hrs
Protection & maintenance of structures - Deterioration due to ageing, inadequate maintenance Facets of Maintenance, importance of Maintenance various aspects of Inspection. Corrosion mitigation techniques to protect the structure from corrosion. Long term health monitoring / Structural health monitoring (SHM)– Definition maintenance of structures and motivation for SHM, Basic components of SHM and its working mechanism.		
Text Books:		



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1. B. Bhattacharjee, Concrete Structures-Repair, Rehabilitation and Retrofitting, CBS Publishers and Distributors Pvt Ltd, 2017
2. R. Dodge Woodson, Concrete Structures-Protection, Repair and Rehabilitation, Elsevier, 2009.

Reference Books:

1. CPWD, Handbook on Repair and Rehabilitation of RCC Buildings, Govt of India Press, New Delhi, 2014.
2. Allen, Harold Roper, and Denison Campbell, Concrete Structures: Materials, Maintenance and Repair, Longman Scientific and Technical, UK, 1st Edition, 1991.
3. R. Dodge Woodson, Concrete Structures: Protection, Repair and Rehabilitation, Elsevier, 1st Edition, 2009.
4. Kenneth and Carper, Forensic Engineering, CRC Press, 1st Edition, 2000.
5. W. H. Ranson, Building Failures – Diagnosis and Avoidance, E. & F.N. Spon, 1st Edition, 1981.
6. R. Holland, Appraisal and Repair of Reinforced Concrete, Thomas Telford Ltd., Edition and Year not specified.

Online Learning Resources:

https://onlinecourses.nptel.ac.in/noc20_ce26/preview

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Identify the causes and types of deterioration in structures and interpret the nature of cracks using IS 456 guidelines.	L1
CO2	Explain the procedures for condition assessment and damage evaluation using both field and lab-based NDT techniques.	L2
CO3	Select appropriate repair materials and techniques based on the type and severity of damage in concrete structures.	L3
CO4	Apply suitable retrofitting and rehabilitation strategies, including engineered demolition methods, with reference to case studies.	L3
CO5	Analyze the significance of corrosion mitigation, preventive maintenance, and SHM in enhancing the service life of structures.	L4

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	2	2	1	-	-	-	1	3	2
CO2	3	3	2	3	2	1	-	-	-	-	-	2	3	2
CO3	3	2	3	2	2	-	2	2	-	-	1	1	3	3
CO4	2	2	3	2	2	-	1	1	1	2	2	2	2	3
CO5	2	2	2	2	2	2	3	2	-	-	1	3	2	3



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HONORS DEGREE IN CIVIL ENGINEERING

DESIGN AND DRAWING OF IRRIGATION STRUCTURES

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0158T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HONOR

Course Objectives:

The objectives of this course are to make the student to:

1. Impart fundamental knowledge on various irrigation systems, soil moisture concepts, and canal design principles. (L1)
2. Provide an understanding of the design aspects of diversion head works and their components. (L2)
3. Introduce the functional and structural design of canal structures and cross-drainage works. (L2)
4. Develop analytical skills in assessing the design and safety of storage head works, including gravity and earth dams. (L3)
5. Explain the importance and design aspects of spillways and energy dissipation arrangements in hydraulic structures. (L2)

Syllabus		Total Hours: 48
Unit-I	Irrigation Systems	8Hrs
Types of irrigation systems, Soil moisture, Irrigation water requirements, Irrigation efficiencies, Methods of application of irrigation water, Water logging – Causes and remedial measures - Canal Systems: Types of canals, Principles of design of stable irrigation canals, Silt theories, Tractive force theory, Design of lined canal, Design of longitudinal section.		
Unit-II	Design of diversion head works	10Hrs
Types of hydraulic structures, Layout of a diversion head work, Design of vertical drop weir, Silt control in head works		
Unit-III	Design of Canal Structures	10Hrs
Canal regulators, Types of canal falls, Design of Sarda type fall, Types of cross drainage works.		
Unit-IV	Storage head works	10Hrs
Types of storage head works, Forces acting on gravity dams, Analysis of gravity dams, Profile of a gravity dam Earth dams: Types of earth dams, Causes of failure of earth dams, Seepage analysis, Seepage control, Stability analysis.		
Unit-V	Spillways and energy dissipation systems	10Hrs
Types of spillways, Ogee spillway, Principles of energy dissipators.		

Text Books:

1. Modi, P. M., 2000, Irrigation Water Resources and Hydropower Engineering, Standard Book Publishing Company, New Delhi.
2. Asawa, G. L., 1996, Irrigation Engineering, New Age International Publishing Company, New Delhi

Reference Books:

1. Arora, K. L., 1996, Irrigation Water Resources Engineering, Standard Book Publishing Company, New Delhi.
2. Murthy, C. S. N., 2002, Water Resources Engineering – Principles and Practice, New Age International Publishing Company, New Delhi
3. C. Satyanarayana Murthy, Design of Minor Irrigation and Canal Structures, Wiley Eastern Ltd.,



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Online Learning Resources:

<https://www.udemy.com/course/irrigation-structures/?couponCode=LEARNNOWPLANS>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain the principles and practices of various irrigation systems, soil moisture concepts, irrigation efficiencies, and canal design methods including silt and tractive force theories.	L2
CO2	Describe the components and layout of diversion head works and apply design principles for weirs and silt control systems.	L2
CO3	Design canal structures such as canal regulators, Sarda-type falls, and cross-drainage works for effective water conveyance.	L3
CO4	Analyze the structural stability and seepage characteristics of gravity dams and earth dams using appropriate design considerations.	L4
CO5	Apply the principles of spillway hydraulics and energy dissipation mechanisms in the design of spillway systems.	L3

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	2	1	-	-	-	-	1	3	2
CO2	3	2	3	2	-	1	-	-	-	-	-	1	3	2
CO3	3	2	3	2	2	-	-	-	-	-	-	1	3	3
CO4	3	3	2	3	2	-	2	-	-	-	-	2	3	3
CO5	2	2	2	3	2	-	2	-	-	-	-	2	2	3



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HONORS DEGREE IN CIVIL ENGINEERING

ROAD SAFETY ENGINEERING

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0159T	3:0:0:0	3	CIE:30 SEE:70	3 Hours	HONOR

Course Objectives:

1. Provide foundational knowledge about the causes and trends of road accidents and the impact of human, vehicle, and roadway factors on highway safety. (L1)
2. Introduce statistical tools and procedures for interpreting and analyzing crash data including black spot and hotspot investigations. (L2)
3. Explain the principles and components of road safety management systems and the role of audits and crash investigations. (L2)
4. Impart understanding of crash reconstruction techniques using physical evidence, kinematic principles, and accident scenarios. (L3)
5. Promote awareness of safety improvement measures in highway planning, design, operation, and enforcement including policy and stakeholder roles. (L2)

Syllabus		Total Hours: 48
Unit-I	Basics of Road Safety	8Hrs
Road accidents, Trends, Global and Indian level, Crash Causation, Collision diagrams; Highway safety; Human factors and road user limitations; Speed and its effect on road safety; Vehicle factors; Highway safety in India.		
Unit-II	Statistical Interpretation and Analysis of Crash Data	10Hrs
Before-after methods in crash analysis, Recording of crash data; Accident Investigation and Analysis; Statistical testing and the role of chance; Black Spot Identification and Investigations, Hot spot analysis, Case Studies.		
Unit-III	Road Safety Management System	10Hrs
Multi-causal dynamic systems approach to safety; Crash Vs. Accident; Road safety improvement strategies; Elements of a road safety plan, Speed management, Safety data Needs; Intersection Safety, Safe vehicle design. Road Safety Audits: Key elements of a road safety audit, Road Safety Audits & Investigations, Work zone safety audit; Crash investigation and analysis, Methods for identifying hazardous road locations, Case Studies		
Unit-IV	Crash Reconstruction	10Hrs
Describe the basic information that can be obtained from the roadway surface, Basic physics related to crash reconstruction, speed for a various skid, friction, drag, and acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies.		
Unit-V	Mitigation Measures	10Hrs
Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation, and accident control measures, Highway Safety Measures during construction, Highway geometry, and safety; Design of Forgiving roads and self-explaining roads, Effective Road Signs and Street Lighting, Safety in urban areas; Public transport and safety; Road safety policy-making, Stakeholders involvement; Road safety law.		

Text Books:

1. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (Reprinted 2002).
2. M. Ohidul Haque, Road Safety: Data Collection, Analysis, Monitoring, And Countermeasure



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Evaluations with Cases, University Press of America, 2008.

Reference Books:

1. IRC: SP: 88-2019 Manual on Road Safety Audit
2. Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 1st Edition, 2016.
3. Rune Elvik, Alena Hoye, and Truls Vaa, The Handbook of Road Safety Measures, Emerald Group Publishing, 2nd Edition, Sept 2009.
4. R. P. Roess, E. S. Prassa, and W. R. Mcshane, Traffic Engineering, Prentice Hall, 2011.

Online Learning Resources:

<https://ebrdelearning.com/road-safety-engineering-e-learning-course>

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Explain road accident trends, human and vehicle factors affecting highway safety, and the Indian scenario of road safety.	L2
CO2	Apply statistical methods for crash data analysis and conduct black spot and hotspot identification with case-based insights.	L3
CO3	Describe the structure of a road safety management system, road safety audit process, and the data needs for improving intersection and vehicle safety.	L2
CO4	Analyze crash reconstruction cases using physical evidence and calculate speed, drag, and impact forces for different accident types.	L4
CO5	Evaluate and recommend mitigation measures such as forgiving road design, road signs, public transport safety strategies, and road safety law enforcement.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	3	2	2	-	-	-	1	2	2
CO2	3	3	2	3	2	-	-	-	-	-	-	2	3	3
CO3	3	2	2	2	2	2	2	2	-	-	-	2	2	3
CO4	3	3	3	3	2	-	-	-	-	-	-	2	3	3
CO5	2	2	3	2	2	3	3	3	2	2	2	3	2	3



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HONORS DEGREE IN CIVIL ENGINEERING

NDT LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0160P	0:0:4:0	2	CIE:30 SEE:70	3Hours	HONOR

Course Objectives:

The objectives of this course are to make the student to:

1. Understand the fundamental principles and significance of non-destructive testing (NDT) in concrete structures. (L2)
2. Apply various NDT techniques to evaluate the structural integrity and quality of concrete. (L3)
3. Analyze data from NDT methods to detect cracks, voids, rebar position, corrosion, and other defects. (L4)
4. Evaluate the durability and in-situ strength characteristics of concrete using advanced testing techniques. (L5)
5. Develop competence in interpreting NDT results for effective decision-making in structural health monitoring. (L5)

Syllabus

Total Hours:48

List Of Experiments :

- 1) To assess the surface hardness and compressive strength of concrete by using Rebound Hammer Test.
- 2) To determine the quality, uniformity, and presence of cracks or voids in concrete by Ultrasonic Pulse Velocity Test.
- 3) To evaluate the compressive strength of hardened concrete using probe penetration by Penetration Resistance Test.
- 4) To measure the depth of carbonation in concrete this leads to corrosion of reinforcement by Carbonation Depth Test.
- 5) To assess the corrosion potential of reinforcing steel in concrete by Half-Cell Potential Test.
- 6) To detect reinforcement position, diameter, and concrete cover over rebars by Rebar Locator.
- 7) To detect subsurface features, rebar locations, and voids in concrete structures by Ground Penetrating Radar.
- 8) To monitor crack propagation and damage activity in structural components by Acoustic Emission Technique.
- 9) To extract cores for testing and conduct visual and microscopic analysis of concrete quality.
- 10) To evaluate thickness, de laminations, and voids in concrete slabs or pavements by Impact Echo Test.
- 11) To measure strain, temperature, or crack growth in structural components using embedded optical fibers.
- 12) To identify surface-breaking defects in non-porous materials BY Dye Penetrant Testing.

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Apply Rebound Hammer and Ultrasonic Pulse Velocity tests to assess surface hardness and detect internal concrete defects.	L3
CO2	Analyze corrosion risk and carbonation depth using Half-Cell Potential and Carbonation Depth tests.	L4
CO3	Evaluate compressive strength and integrity of concrete using Penetration Resistance and Impact Echo methods.	L5



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CO4	Detect reinforcement layout, cover, and subsurface anomalies using Rebar Locator and Ground Penetrating Radar.	L4
CO5	Interpret results from advanced methods like Acoustic Emission and core testing for structural damage diagnosis.	L5

CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	3	-	-	-	1	1	-	2	3	2
CO2	2	3	1	2	3	3	2	2	-	1	-	1	2	3
CO3	2	3	2	3	3	-	-	-	-	1	-	1	3	2
CO4	3	2	2	3	3	-	2	-	-	1	-	2	3	2
CO5	3	3	2	3	3	2	1	1	1	2	1	3	3	3



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HONORS DEGREE IN CIVIL ENGINEERING

ETABS/SAP LAB

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
23A0161P	0:0:4:0	2	CIE:30 SEE:70	3Hours	HONOR

Course Objectives:

The objectives of this course are to make the student to:

1. To understand the interface, tools, and modeling environment of ETABS and SAP2000 for structural design. (L2)
2. To develop and analyze multi-storey buildings, shear walls, and frames under various loads using ETABS and SAP2000. (L3)
3. To perform structural modeling, assign loads, and interpret analysis results for real-world building and infrastructure systems. (L4)
4. To evaluate performance-based seismic behavior and nonlinear analysis techniques using advanced structural software. (L5)
5. To design and optimize structural components like water tanks and bridges using advanced modeling tools. (L6)

Syllabus

Total Hours:48

List Of Experiments:

- 1) Determination of ETABS Interface and Structural Modelling Techniques
- 2) Analysis of a Multi-Story Building under Lateral Loads in ETABS
- 3) Development of Structural Analysis for a Shear Wall System in ETABS
- 4) Application of Performance-Based Seismic Analysis in ETABS
- 5) Determination of Structural Analysis of a Simple Frame using SAP2000
- 6) Development of a Bridge Model and Load Analysis in SAP2000
- 7) Analysis and Design of an Elevated Water Tank using SAP2000
- 8) Application of Nonlinear Analysis for a Structural System using SAP2000

Course Outcomes:

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

Cos	Statements	Blooms level
CO1	Understand and operate the ETABS and SAP2000 interface for modelling structural systems.	L2
CO2	Apply ETABS for analysis of multi-story buildings and shear wall systems under lateral and gravity loads.	L3
CO3	Analyze and interpret the behaviour of structural models including performance-based and nonlinear seismic analysis.	L4
CO4	Evaluate the design of structural elements such as frames, water tanks, and bridges using SAP2000.	L5
CO5	Create detailed structural models and conduct advanced simulations to support safe and economical design decisions.	L6



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CO – PO Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	2	-	-	-	-	-	-	2	3	2
CO2	3	3	2	2	3	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	3	3	3
CO5	3	2	3	3	3	-	-	-	-	-	-	3	3	3

Member Secretary

Head of the Department,
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LIST OF MINORS OFFERED BY THE CIVIL ENGINEERING BUILDING PLANNING & CONSTRUCTION TECHNOLOGY

S.No	Course Code	Course Title	Contact Hours per week			Credits
			L	T	P	
1	23A0162T	Construction Materials	3	-	0	3
2	23A0163T	Construction Methods	3	-	0	3
3	23A0164T	Building Planning and Drawing	3	-	0	3
4	23A0165T	Surveying	3	-	0	3
5	23A0166T	Concrete Technology	3	-	0	3
6	23A0167P	Concrete Technology Lab	0	0	3	1.5
7	23A0168P	Surveying Lab	0	0	3	1.5
Total						18

Member Secretary

Head of the Department,
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CE-HOD



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LIST OF MINORS OFFERED TO CIVIL ENGINEERING

S.No	Minor Title	Department offering the Minor
1	Micro Grid Technology	EEE
2	Energy Systems	
3	3D Printing	ME
4	Industrial Engineering	
5	Embedded Systems and IoT	ECE & VLSI
6	Electronic Systems	
7	Computer Science and Engineering	CSE & Allied
8	Cyber Security	
9	Internet of Things	
10	Data Science	
11	Artificial Intelligence & Machine Learning	
12	Data Analytics	
13	Data Science and Analytics	
14	Programming & Computational Intelligence	
15	AI Applications & Emerging Technologies	
16	Quantum Computing	
17	Quantum Technologies	

Member Secretary

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