



B.TECH. (CIVIL ENGINEERING) PROGRAM STRUCTURE (2025-29)

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	08	07		--	--	--	--	--	15
Engineering Science Course		08	07		--	--	--	--	--	15
Programme Core Course (PCC)	Program Courses	--	02	10	10	10	10	12	--	54
Programme Elective Course (PEC)		--	--	--	--	04	06	04	06	20
Vocational Courses (Industrial collaboration Course)	Skill Courses	--	--	--	--	--	--	02	--	10
Skill Enhancement Course (Professional Development)		01	01	01	01	02	02	--	--	
Ability Enhancement Course (AEC -01, AEC-02) (Ex. Language Lab, CS, EEE)	Humanities Social Science and Management (HSSM)	02	--	--	02	--	--	--	--	04
Entrepreneurship/Economics/ Management Courses		--	--	02	02	--	--	--	--	04
Indian Knowledge System (IKS)		--	02		--	--	--	--	--	02
Value Education Course (VEC) (Ex. UHV-II, environmental courses)		--	--	02	02	--	--	--	--	04
Constitution of India		--	--	--	--	--	AU	--	--	AU
Do It Yourself (DIY)	Experiential Learning Courses	AU	AU	01	01	01	01	01	--	05
PBL		01	01	01	01	01	01	01	--	07
Internship/ OJT		--	--			--	--	--	12	12
Co-curricular Courses (CC) (NSS / YOGA/ Health & Wellness)	Liberal Learning Courses	01	01	--	--	--	--	--	--	02
Open Elective (OE) Other than a particular program		--	--	04	02	02	--	--	--	08
Total Credits (Major)		21	21	21	21	20	20	20	18	162
Multidisciplinary Minor (MDM)	Multidisciplinary Courses	--	--	02	03	03	03	03	--	14
(B.E./ B.Tech. or Equivalent) in Engg. / Tech. with Multidisciplinary Minor Major + MDM = 162+14 = 176 Credits									176	

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Honors and Multidisciplinary Minor		--	--	2	4	4	4	4	--	18
4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg. / Tech.- Honors and Multidisciplinary Minor Major + Honors + MDM = 162+18+14 = 194 Credits - Students with a minimum CGPA of 7.5 without backlog courses at the end of Second semester and should have earned 42 credits are eligible for admission to the UG Bachelor's Degree with Honors.										194
Honors with Research and Multidisciplinary Minor		--	--	--	--	--	--	08	10	18
4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg. / Tech.- Honors with Research and Multidisciplinary Minor Major + Research MDM = 162+18+14 = 194 Credits - Students with a minimum CGPA of 7.5 without backlog courses at the end of Sixth semester and should have earned 124 credits are eligible for admission to the UG Bachelor's Degree with Research.										194
Double Minors (Multidisciplinary and Specialization Minors)		--	--	2	4	4	4	4	--	18
4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg. / Tech.- Major Engg. Discipline with Double Minors (Multidisciplinary and Specialization Minors) Major + MDM + Specialized Minor = 162+14+18 = 194 Credits - Students with a minimum CGPA of 7.5 without backlog courses at the end of Second semester and should have earned 42 credits are eligible for admission to the UG Bachelor's Degree with Double Minor.										194

Note:

- Multiple entry & exit criteria will be in accordance with the AICTE/UGC/DTE/NEP-2020 guidelines.
- For Audit Course (AU), participation is mandatory but not included in Grade calculation.
- The Honors and Specialization Minor (Double Minor) offered by the program is exclusively for students of that program. Only students with a minimum CGPA of 7.5 and no backlogs at the end of the Second Semester are eligible. Students must maintain a minimum CGPA of 7.5 and remain without backlogs throughout the program. To earn the Honors and Specialization Minor (Double Minor), students must complete all the courses offered by the program.
- The Honors and Specialization Minor (Double Minor) courses shall be offered through the SWAYAM/NPTEL online learning platform. The Board of Studies (BoS) shall identify, approve, and recommend the course based on its relevance to the program curriculum, academic quality, and prevailing industry standards.

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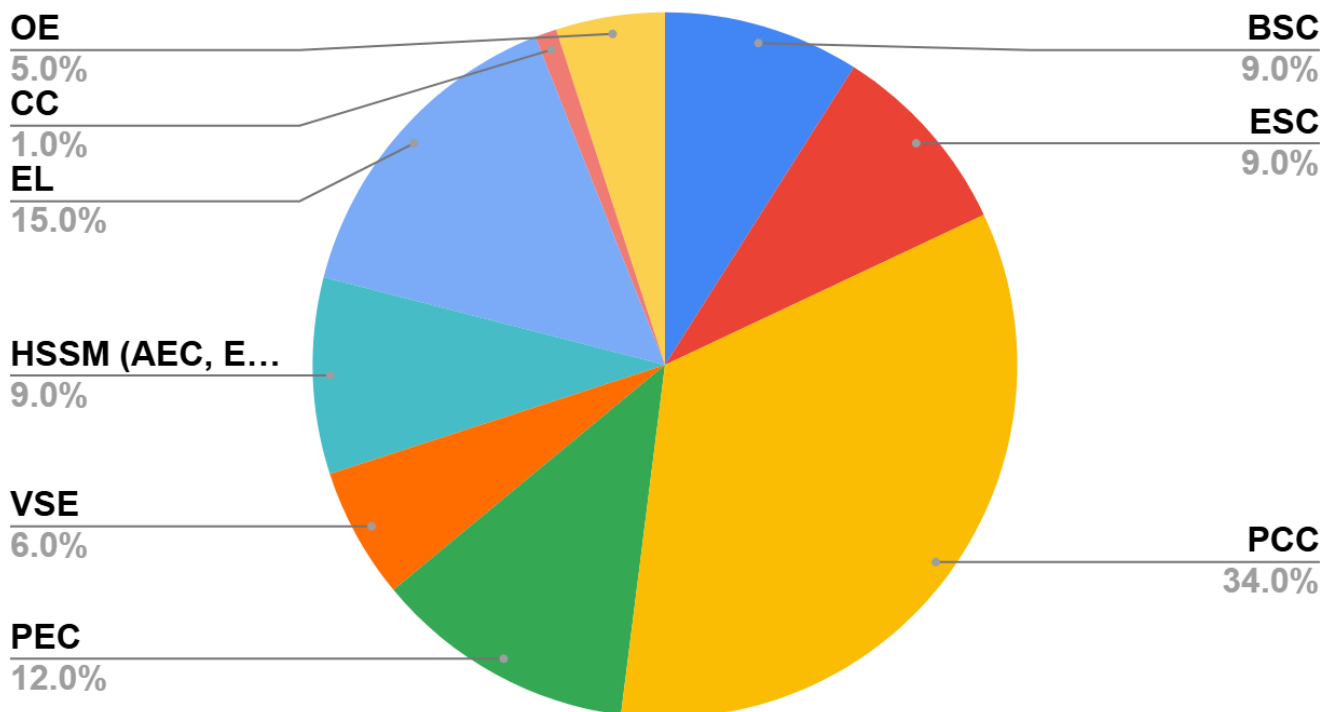
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B.Tech. in Civil Engineering

Course Category	Credits	% Credits
Basic Science (BSC)	15	9%
Engineering Science (ESC)	15	9%
Program Core Courses (PCC)	54	34%
Program Elective Courses (PEC)	20	12%
Vocational & Skill Enhancement (VSE)	10	6%
Humanity, Social Science & Management (AEC, EM, IKS, VEC) HSSM	14	9%
Experiential Learning (EL)	24	15%
Co-Curriculum Courses (CC)	2	1%
Open Electives (OE)	8	5%
Total Credits	162	

Course Category wise % Credits



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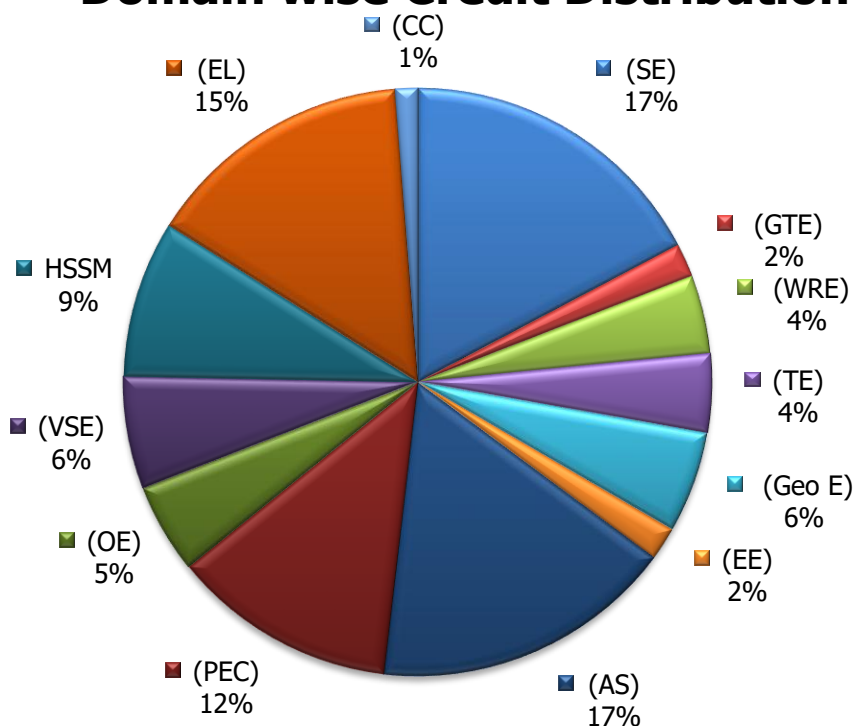


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Domain	Credits	% Credits
Structural Engineering (SE)	28	17
Geotechnical Engineering (GTE)	3	2
Water Resources Engineering (WRE)	7	4
Transportation Engineering (TE)	7	4
Geomatics Engineering (GE)	9	6
Environmental Engineering (EE)	3	2
Allied Science (AS)	27	17
Program Elective Courses (PEC)	20	12
Open Electives (OE)	8	5
Vocational & Skill Enhancement (VSE)	10	6
Humanity, Social Science & Management (AEC, EM, IKS, VEC) HSSM	14	9
Experiential Learning (EL)	24	15
Co-Curriculum Courses (CC)	2	1
Total Credits	162	

Domain wise Credit Distribution



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SEMESTER I													
Category	Course Code	BOS	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	PR	Total	CA-I	CA-II	MSE	ESE	Total	
BSC	NT251001	BSH	Linear Algebra and Calculus	3	1		4	10	10	20	60	100	4
BSC	NT251002	BSH	Applied Science II	3			3	10	10	20	60	100	3
ESC	GE251101	ME	Engineering Graphics	3			3	10	10	20	60	100	3
ESC	NT251102	CS	Programming for Problem Solving	3			3	10	10	20	60	100	3
HSSM-AEC	GE251701	BSH	Modern Indian Language I	2			2	10	10	20	60	100	2
BSC	NT251003	BSH	Applied Science II Lab			2	2	15	15		20	50	1
ESC	GE251103	ME	Engineering Graphics Lab			2	2	15	15		20	50	1
ESC	NT251104	CS	Programming for Problem Solving Lab			2	2	15	15		20	50	1
LLC	GE251901	BSH	NSS			2	2	25	25			50	1
ELC	GE251803	-	PBL: Design Thinking Lab			2	2	15	15		20	50	1
ELC	GE251802	ME/ CE	Do It Yourself I			2	2	25	25			AU	AU
SC-SEC	GE251601	-	Professional Development I			2	2	15	15		20	50	1
Total				14	1	14	29					800	21

SEMESTER II													
Category	Course Code	BOS	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	PR	Total	CA-I	CA-II	MSE	ESE	Total	
BSC	NT252004	BSH	Multivariable Calculus	3			3	10	10	20	60	100	3
BSC	NT252005	BSH	Applied Science I	3			3	10	10	20	60	100	3
ESC	GE252102	ET	Basic Electronics and Electrical Engineering	3			3	10	10	20	60	100	3
ESC	NT252105	CE	Engineering Mechanics	3			3	10	10	20	60	100	3
PCC	NT252201	ME/C E	Applied Engineering	2			2	10	10	20	60	100	2
HSSM-IKS	GE252702	BSH	Indian Knowledge System	2			2	10	10	20	60	100	2
BSC	NT252006	BSH	Applied Science I Lab			2	2	15	15		20	50	1
ESC	NT252106	ME	Workshop Practices			2	2	15	15		20	50	1
LLC	GE252902	BSH	Sports			2	2	25	25			50	1
ELC	GE252801	-	PBL: Engineering Exploration Lab			2	2	15	15		20	50	1
ELC	GE252804	ET	Do It Yourself II			2	2	25	25			50	AU
SC-SEC	GE252602	-	Professional Development II			2	2	15	15		20	50	1
Total				16		12	28					850	21

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SEMESTER III													
Category	Course Code	BOS	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	PR	Total	CA-I	CA-II	MSE	ESE	Total	
PCC	CE253202	CE	Mechanics of Solids	3			3	10	10	20	60	100	3
PCC	CE253203	CE	Concrete Technology	3			3	10	10	20	60	100	3
PCC	CE253204	CE	Surveying	2			2	10	10	20	60	100	2
#HSSM - EEMC	CE253703	CE	Engineering Economics	2			2	10	10	20	60#	100	2
#HSSM-VEC	GE253704	BSH	Universal Human Values II	2			2	10	10	20	60#	100	2
*OE	CE253501 - 503	CE	Open Elective I	4			4	10	10	20	60	100	4
PCC	CE253205	CE	Mechanics of Solids and Concrete Technology Lab			2	2	15	15		20	50	1
PCC	CE253206	CE	Surveying Lab			2	2	15	15		20	50	1
SC-SEC	CE253603	CE	Professional Development III			2	2	15	15		20	50	1
ELC	CE253805	CE	Do It Yourself III			2	2	15	15		20	50	1
ELC	CE253806	CE	PBL III: Problem Based Learning			2	2	15	15		20	50	1
Total for Major				16		10	26					850	21
*MDM	CE253401	CE	MDM I	2			2	10	10	20	60	100	2
Total for Major with Multidisciplinary Minor (Mandatory Credits)													23
HMM	CE253207	CE	HMM I	2			2	10	10	20	60	100	2
OR (Students will be allotted either HMM or DM as per defined criteria)													
DM	CE253208	CE	DM I	2			2	10	10	20	60	100	2
Total for Major with MDM + (HMM/DM)				20		10	30					1050	25

* Courses offered by Civil Engineering Department for other department students.

End Semester evaluation done at department level

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SEMESTER IV													
Category	Course Code	BOS	Name of the Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	PR	Total	CA-I	CA-II	MSE	ESE	Total	
PCC	CE254209	CE	Structural Mechanics I	3			3	10	10	20	60	100	3
PCC	CE254210	CE	Building Planning, Construction and Materials	3			3	10	10	20	60	100	3
PCC	CE254211	CE	Fluid Mechanics	3			3	10	10	20	60	100	3
#HSSM-AEC	GE254705	BSH	Modern Indian Language II	2			2	10	10	20	60 [#]	100	2
\$HSSM-EEMC	CE254706	CE	Entrepreneurship Development	2			2	10	10	20	60 ^{\$}	100	2
#HSSM-VEC	CE254707	CE	Environmental and Sustainable Engineering	2			2	10	10	20	60 [#]	100	2
*OE	CE254504 - 506	CE	Open Elective II	2			2	10	10	20	60	100	2
PCC	CE254212	CE	Environmental Engineering and Fluid Mechanics Lab			2	2	15	15		20	50	1
SC-SEC	CE254604	CE	Professional Development IV			2	2	15	15		20	50	1
ELC	CE254807	CE	Do It Yourself IV			2	2	15	15		20	50	1
ELC	CE254808	CE	PBL IV: Problem to Project Based Learning			2	2	15	15		20	50	1
Total for Major				17		8	25					900	21
*MDM	CE254402	CE	MDM II	3			3	10	10	20	60	100	3
Total for Major with Multidisciplinary Minor (Mandatory Credits)													24
HMM	CE254213	CE	HMM II	4			4	10	10	20	60	100	4
OR (Students will be allotted either HMM or DM as per defined criteria)													
DM	CE254214	CE	DM II	4			4	10	10	20	60	100	4
Total for Major with MDM + (HMM/DM)				24		08	32					1100	28

* Courses offered by Civil Engineering Department for other department students.

End Semester evaluation done at department level

\$ End Semester evaluation done at department level by Open-Book Examination

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Open Elective Bucket Offered by All Departments						
Department	OE I (SEM III)		OE II (SEM IV)		OE III (SEM V)	
	Credit: 4		Credit: 2		Credit: 2	
	Course code	Course Name	Course code	Course Name	Course code	Course Name
Civil*	CE253501	Environmental Impact Assessment	CE254504	Remote Sensing and Geographic Information Systems	CE255507	Interior Designs and Drawing
	CE253502	Experimental Stress Analysis	CE254505	Town Planning	CE255508	Development Engineering
	CE253503	Composite Materials	CE254506	Operation Research	CE255509	Planning for Sustainable Development
Mechanical	ME253501	Mechatronics	ME254504	3D Printing Technologies	ME255507	3D Printing and Rapid Prototyping
	ME253502	Project Management for Engineers	ME254505	Robotics and Automation	ME255508	EV Technology
	ME253503	Numerical Methods in Engineering	ME254506	Energy Storage and Management Systems	ME255509	Renewable Energy Sources
E&TC	ET253501	Digital Electronics	ET254504	Sensors and Actuators	ET255507	Internet of Things
	ET253502	Signals & Systems	ET254505	Electrical Machines	ET255508	Instrumentation Engineering
	ET253503	Electronic Devices and Circuits	ET254506	Computer Architecture	ET255509	Wireless Communication Basics
CSE	CS253501	C Programming	CS254504	Object Oriented Programming using Java	CS255507	Advanced JAVA
	CS253502	Data Science and Analytics	CS254505	Fundamentals of Machine Learning	CS255508	Artificial Intelligence and Applications
	CS253503	Open Source and Software Technology	CS254506	Web Development Technologies	CS255509	Computer Network and Security

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AIML	AI253501	Python Programming	AI254504	Cyber Security Fundamentals	AI255507	Internet of Things
	AI253502	Prompt Engineering	AI254505	Artificial Intelligence & Data Science	AI255508	Autonomous Intelligent System
	AI253503	Components and Applications of the Internet of Things	AI254506	Ethical Hacking	AI255509	Quantum Computing

***The Open Elective (OE) courses offered by the Department of Civil Engineering are exclusively intended for students of other departments and are not open to students of the Civil Engineering Department.**



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Multidisciplinary Minor (MDM) Courses Offered by All Departments										
Department	MDM-I (SEM III)		MDM-II (SEM IV)		MDM- III (SEM V)		MDM- IV (SEM VI)		MDM-V (SEM VII)	
	Credit: 2		Credit: 3		Credit: 3		Credit: 3		Credit: 3	
	Course code	Course Name	Course code	Course Name	Course code	Course Name	Course code	Course Name	Course code	Course Name
Civil*	CE253 401	Basic Civil Engineering	CE254 402	Building Construction and Materials	CE255 403	Building Planning & Drawing	CE254 404	Building Estimates & Tendering	CE254 405	Construction Management
Mechanical	ME253 401	Basic Mechanical Engineering	ME254 402	Metrology and Mechanical Measurements	ME255 403	Product Design and Development	ME256 404	Smart Materials	ME257 405	Automobile Engineering
E&TC	ET253 401	Basic Electronics and Communication Engineering	ET254 402	Digital Electronic s and Logic Design	ET255 403	Microproce ssors and Microcontro llers	ET256 404	Communica tion Systems and Networking	ET257 405	Embedded Systems
CSE	CS253 401	Database Systems	CS254 402	Computational Statistics for AI	CS255 403	Predictive Analytics and Visualization	CS256 404	Advanced Machine Learning	CS257 405	Prompt Engineering
AIML	AI2534 01	Database Systems	AI2544 02	Computational Statistics for AI	AI2554 03	Predictive Analytics and Visualization	AI2564 04	Advanced Machine Learning	AI2574 05	Prompt Engineering
*The MDM courses offered by the Department of Civil Engineering are exclusively intended for students of other departments and are not open to students of the Civil Engineering Department.										

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****Honors**

Semester	Code	BOS	Course	No. of Credits
SEM III	CE253207	CE	SWAYAM/NPTEL	2
SEM IV	CE254213	CE	SWAYAM/NPTEL	4

****Specialization Minor (Double Minor)**

Semester	Code	BOS	Course	No. of Credits
SEM III	CE253208	CE	SWAYAM/NPTEL	2
SEM IV	CE254214	CE	SWAYAM/NPTEL	4

****The Honors and Specialization Minor (Double Minor) offered by the Department of Civil Engineering is exclusively for Civil Engineering students.**

Only students with a minimum CGPA of 7.5 and no backlogs at the end of the Second Semester are eligible.

Students must maintain a minimum CGPA of 7.5 and remain without backlogs throughout the program. To earn the Specialization Minor (Double Minor), students must complete one specialization track in a Civil Engineering domain offered by the Department.

These courses shall be offered through the SWAYAM/NPTEL online learning platform. The Board of Studies (BoS) shall identify, approve, and recommend the course based on its relevance to the program curriculum, academic quality, and prevailing industry standards.

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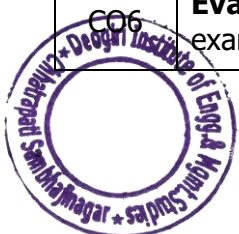
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Course Title: Mechanics of Solids**Course Code: CE253202****Course Category: PCC**

Teaching Scheme		Examination Scheme	
Lectures: 03 hrs. / week		CA-1	10 Marks
Tutorial: --		CA-2	10 Marks
Credits: 03		MSE	20 Marks
Semester: Second Year (Semester III)		ESE	60 Marks
Course Prerequisite: • Engineering Mechanics (Statics) – equilibrium of forces, free body diagrams, and moments. • Basic Physics (Mechanics) – fundamental laws of motion and force systems. • Basic Mathematics – algebra, trigonometry, and elementary calculus used in engineering analysis.			
Course Description: This course covers the fundamental principles of material behavior and structural mechanics. Students will analyze stress, strain, and internal forces—including axial, shear, and bending—in beams, shafts, and columns. Key topics include combined stresses, Mohr's circle, and failure theories. This foundation is essential for advanced design in reinforced concrete, steel, and structural analysis.			
Course Objectives: 1. To develop a strong foundation in the fundamental concepts, terminology, and laws governing stress, strain, and material behavior. 2. To build conceptual understanding of the mechanical behavior of materials and structural members under various loading conditions. 3. To equip students with the ability to apply fundamental principles and standard equations for analyzing stresses, strains, and internal forces. 4. To train students in the use of analytical methods and systematic procedures for solving practical engineering problems related to structural elements. 5. To enhance analytical skills required to assess the response of materials and structural systems under different loading and boundary conditions. 6. To develop the capability to evaluate and interpret the mechanical performance and failure behavior of engineering components.			

Course Outcomes:

COs	After completion of the course students will be able to	Bloom's Level
CO1	Recall fundamental concepts, definitions, laws, and standard relationships related to stress, strain, and material behavior.	Remember (Level 1)
CO2	Explain the behavior of materials and structural members under different loading conditions using basic mechanical principles.	Understand (Level 2)
CO3	Apply fundamental principles and standard equations to determine stresses, strains, and internal forces in engineering components.	Apply (Level 3)
CO4	Use appropriate analytical methods and procedures to solve practical engineering problems involving structural elements	Apply (Level 3)
CO5	Analyze the response of materials and structural systems under various loading and boundary conditions to identify critical parameters	Analyze (Level 4)
CO6	Evaluate and interpret the mechanical behavior of engineering components by examining stress distribution, deformation patterns, and failure conditions	Analyze (Level 4)

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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	-	-	-	-	-	1	3	-	-
CO2	3	2	1	-	-	-	-	-	-	-	1	3	-	-
CO3	3	3	2	1	-	-	-	-	-	-	1	3	-	-
CO4	3	3	2	2	-	-	-	1	1	-	1	3	-	-
CO5	3	3	2	3	-	-	-	1	1	-	1	3	-	-
CO6	3	3	3	3	-	-	-	1	1	-	1	3	-	-

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	SIMPLE STRESS AND STRAIN Analysis of internal forces, simple stress, shearing stress, bearing stress, statically determinate members, and thermal stresses. Stress strain diagram for different engineering materials and its importance for elastic and plastic analysis, Hooke's law, axial and shearing deformations, Poisson's ratio, biaxial and tri-axial deformations, relationship between modulus of rigidity and modulus of elasticity & bulk modulus.	6 Hrs.
Unit 2	SHEAR FORCE AND BENDING MOMENTS IN BEAM Introduction, Types of supports and beams, Sign convention for SF and BM, Shear Force and Bending Moment diagrams. BM and SF diagrams for cantilevers and simply supported beams with and without overhangs. Calculation of maximum BM and SF and the point of contraflexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of loads, uniformly varying load, and couples.	6 Hrs.
Unit 3	BENDING STRESSES BENDING STRESS: Assumptions in the theory of simple bending, 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 beam, Flitched beams.	6 Hrs.
Unit 4	SHEAR STRESSES AND TORSION Stresses in beams due to Shear, Shear stress distribution diagram for common symmetrical sections (with at least one axis of symmetry), maximum and average shear stress.	6 Hrs.



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	Torsion-Assumptions, derivation of torsion formulae, torsion of circular shafts, power transmission, stresses and deformation in the determinate solid/hollow homogeneous shafts, design of shaft.	
Unit 5	COLUMNS AND STRUTS Concept of short and long columns, formulae by Euler and Rankin, Euler's Crippling load for different end conditions, limitation of Euler's formula, equivalent length, eccentrically loaded short compression members, kern of a section.	6 Hrs.
Unit 6	COMBINED STRESSES AND THEORIES OF FAILURE Principal Stresses and Strains-Normal and shear stresses on any oblique Plane and Concept of Principal Planes and Principal Stresses by Analytical and Mohr's Circle method. Theories of Failure- Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum Strain Energy Theory, Maximum Shear Stress Theory, Maximum Shear Energy Theory.	6 Hrs.

Sr. No.	Textbooks
1.	R. K. Bansal, A Textbook of Strength of Materials, Laxmi publications Pvt. Ltd., New Delhi, 2nd edition, 2007
2.	F. Beer, E. R. Johnston, J. DeWolf, Mechanics of Materials, Tata McGraw-Hill Publishing Company Ltd., New Delhi, India, 1st edition, 2008.
3.	S. S. Bhavikatti, Strength of Materials, Vikas Publishing House Pvt. Ltd., New Delhi, 5th Edition, 2013.
4.	F. L. Singer and Pytel, "Strength of Material", Harper and Row publication
5.	Sadhu Singh, 1978, "Strength of Materials", Khanna Publishers, N. Dehli, ISBN No. 978 81-7409-048-7
6.	Ramamrutham S., 2011, "Strength of Materials", Dhanpat rai and Sons, Delhi
Sr. No.	Reference Books
1.	B. C. Punmia, Ashok K Jain and Arun K Jain, Mechanics of Materials, Laxmi Publications Pvt. Ltd., New Delhi, 12th Edition, 2007.
2.	R. Subramanian, Strength of Materials, Oxford University Press, 2nd Edition, 2010
3.	Hibbeler, R. C., Mechanics of Materials, East Rutherford, NJ: Pearson Prentice Hall, 6th Edition, 2004.
4.	Gere and Timoshenko, "Mechanics of Materials", CBS publishers.
5.	Popov E.P., 2015, "Introduction to Mechanics of Solids", Prentice-Hall, Second Edition 2005
Sr. No.	Web Resources
1.	NPTEL – Strength of Materials (IIT Madras / IIT Roorkee) https://nptel.ac.in/courses/112106141
2.	NPTEL – Mechanics of Solids (IIT Kanpur) https://nptel.ac.in/courses/105104160
3.	NPTEL – Solid Mechanics (SWAYAM Platform) https://onlinecourses.nptel.ac.in/noc22_ce46/preview



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Course Title: Concrete Technology**Course Code: CE253203****Course Category: PCC**

Teaching Scheme	Examination Scheme	
Lectures: 03 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: Second Year (Semester III)	ESE	60 Marks
Course Prerequisite: • Mechanics of Materials– Basic knowledge of stress–strain relationships, elastic behavior of materials, modulus of elasticity, and deformation characteristics. • Applied Chemistry– Fundamental understanding of chemical reactions, hydration processes, and material composition relevant to cement chemistry and admixtures. • Building Materials– Basic knowledge of common construction materials such as cement, aggregates, steel, and water used in construction.		
Course Description: This course covers the fundamental aspects of concrete technology, including the properties and testing of constituent materials such as cement, aggregates, and water. It explains the behavior of fresh and hardened concrete, the role of admixtures, and different types of special concrete. The course also introduces principles of concrete mix design and basic non-destructive testing methods used to assess concrete quality and durability.		
Course Objectives: 1. To develop a fundamental understanding of concrete materials, their properties, and relevant standards used in construction practice. 2. To explain the behavior of concrete in fresh and hardened states and understand the role of different constituents and processes affecting their performance. 3. To apply principles of concrete technology in performing calculations, testing procedures, and basic design related to concrete production and quality control. 4. To use standard codes and established methods for material selection, mix proportioning, and evaluation of concrete performance in practical situations. 5. To analyze the influence of material characteristics, environmental conditions, and construction practices on the strength, durability, and overall performance of concrete.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Recall fundamental concepts, terminology, properties, and standards related to concrete materials, processes, and testing.	Remember (Level 1)
CO2	Explain the behavior, characteristics, and interrelationships of concrete constituents, fresh concrete, hardened concrete, and associated processes.	Understand (Level 2)
CO3	Apply principles of concrete technology to perform calculations, testing procedures, and basic design tasks relevant to concrete production and quality control.	Apply (Level 3)
CO4	Use standard methods, codes, and procedures to select materials, proportion mixes, and evaluate concrete performance in practical engineering situations.	Apply (Level 3)
CO5	Analyze the effects of material properties, environmental conditions, and construction practices on the performance, durability, and strength of concrete.	Analyze (Level 4)
CO6	Evaluate the quality, uniformity, and integrity of concrete structures using non-destructive testing methods such as rebound hammer and ultrasonic pulse velocity tests and interpret results for engineering decisions.	Evaluate (Level 5)

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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	1	3	-	-
CO2	3	2	-	1	-	-	-	-	-	-	1	3	-	-
CO3	3	2	2	1	-	-	-	-	-	-	1	3	-	-
CO4	3	2	3	1	-	-	-	-	-	-	1	3	-	-
CO5	3	2	2	1	-	-	-	-	-	-	1	3	-	-
CO6	3	2	2	1	-	-	-	-	-	-	1	3	-	-

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Ingredients of Concrete -Cement-manufacturing process, physical properties, hydration of cement, hydration products, chemical compounds in cement, types of cement, Aggregates- classification of aggregates, physical properties, mechanical properties, fineness and gradation of aggregates using sieve analysis, tests on aggregates. Water-specifications of water to be used for concrete, quality of water for use in concrete,	7 Hrs.
Unit 2	Properties of Fresh Concrete -Nominal mix concrete, types of batching, mixing, transportation, placing including pumping and compaction techniques, workability, factors affecting workability, methods of measuring workability, segregation and bleeding, setting time, curing of concrete, types of curing, temperature effects on fresh concrete.	7 Hrs.
Unit 3	Properties of Harden Concrete -Desired properties of concrete, strength, durability, characteristic strength, compressive, tensile and flexure strength of concrete, stress-strain relationship tests on concrete, modulus of elasticity, effect of w/c ratio and admixtures on strength, creep and shrinkage of concrete, durability of concrete: minimum & maximum cement content, strength & durability relationship, exposure to different conditions, factors contributing to cracks in concrete, sulphate attack, alkali aggregate reaction.	6 Hrs.
Unit 4	Admixtures & Special Concrete -Admixtures -Role of admixture, classification and types of admixtures like accelerators, retarders, plasticizers, super plasticizers, mineral admixtures-fly ash, silica fume, ground granulated blast furnace slag. Special concretes – Lightweight concrete and its types, self-compacting concrete, high density concrete, fiber reinforced concrete, High Strength Concrete, High Performance concrete, geo-polymer concrete and Ferrocement technique.	6 Hrs.



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Unit 5	Concrete Mix Design -Factors Governing Mix Design, Methods of Mix Design. factors affecting the mix design, Methods of Expressing Proportions, Trial Mixes, Acceptance Criteria, Factors Causing Variations, Quality Measurement in Concrete Construction	6 Hrs.
Unit 6	Non-destructive Testing - Non-destructive Testing of Concrete-rebound hammer test, ultrasonic pulse velocity test.	4 Hrs.

Sr. No.	Textbooks
1.	Gambhir M. L. "Concrete Technology", Tata Mc-Graw Hill 2015 15th edition
2.	Shetty M. S. "Concrete Technology", S. Chand 2005
3.	Krishnaswamy, "Concrete Technology", Dhanapat Rai and Sons
Sr. No.	Reference Books
1.	Orchard, "Concrete Technology", Applied Science Publishers
2.	Neville A. M., "Concrete Technology", Pearson Education
3.	Neville A. M., "Properties of Concrete", Pearson Education
4.	Relevant Publications by Bureau of Indian Standards, New Delhi
5.	IS:10262(2009), IS:456 (2009), IS 4926 (2003)
Sr. No.	Web Resources
1.	NPTel (IIT Courses) https://onlinecourses.nptel.ac.in/noc23_ce50/preview
2.	Advanced Concrete Technology Course https://onlinecourses.nptel.ac.in/noc25_ce73/preview
3.	Admixtures And Special Concretes Course https://onlinecourses.nptel.ac.in/noc23_ce61/preview



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Course Title: Surveying
Course Code: CE253204

Course Category: PCC

Teaching Scheme	Examination Scheme	
Lectures: 02 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester III)	ESE	60 Marks

Course Prerequisite:

- Applied Engineering- Basic knowledge of Civil Engineering Field
- Basic Mathematics- Knowledge of Algebra and Trigonometry

Course Description: Surveying is generally used to make land maps and boundaries. The development of engineering survey is the basic foundation to ensure the quality of the project, because it can provide accurate data for the subsequent construction. Without surveying, the placement, security, and safety of projects cannot be assured. Therefore, the students are required to develop such competency to carry out the given type of survey using relevant equipment so as to prepare the plan to interpret the information to take the appropriate decisions. This course will help the students in achieving in above mentioned goal.

Course Objectives:

1. Develop fundamental understanding of surveying by explaining the basic principles, concepts, terminology, and applications of surveying.
2. Provide practical knowledge of linear and angular measurements by demonstrating appropriate surveying methods, instruments, field procedures, and measurement techniques.
3. Develop students practical and analytical skills through hands-on exercises involving advanced surveying methods, field observations, data collection, calculations, and interpretation.
4. Familiarize students with modern surveying technologies by introducing and demonstrating the applications of GIS, GPS, EDM, and Total Station in contemporary civil engineering projects.

Course Outcomes:

COs	After completion of the course students will be able to	Bloom's Level
CO1	Describe various methods of linear and angular measurements.	Remember (Level 1)
CO2	Determine the relative positions of various points on the earth surface.	Understand (Level 2)
CO3	Identify different instruments, tools, applications, and techniques to determine area, positions, distances, and angles between two points on the earth's surface.	Understand (Level 2)
CO4	Operate the instruments used , principles adopted and methods involved in surveying.	Apply (Level 3)
CO5	Prepare a map or plan to represent an area on a horizontal plan.	Apply (Level 3)
CO6	Analyze various surveying data to solve civil engineering problems.	Analyze (Level 4)



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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	-	2	-	-	-	-	-	-	3	2	1
CO2	3	2	-	-	2	-	-	1	-	-	-	3	1	1
CO3	3	2	1	-	2	-	-	1	-	-	-	3	2	1
CO4	3	2	2	-	2	-	-	1	-	-	-	3	2	1
CO5	3	2	1	-	2	-	-	1	-	-	-	3	1	1
CO6	3	2	2	-	2	-	-	1	-	-	-	3	1	1

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Compass and Plane Table Surveying Introduction, Principles of surveying, Plans and maps, concept of Scale, Chain Surveying, use of Prismatic Compass, Bearing of lines, Local attraction, Magnetic declination. Plane Table survey: Instrument and accessories for plane table survey, Orientation of plane table, advantages and disadvantages, Errors in plane table surveying, Methods of plane table survey: Radiation, Intersection, Traversing and resection.	4hrs
Unit 2	Levelling and Contouring Introduction, Types of levelling, Types of benchmarks, Booking and Reducing levels, Study and use of Auto level. Reciprocal levelling, profile levelling, Cross sectioning and their applications. Curvature and refraction corrections. Contouring: Introduction, Characteristics of Contours, Methods and Interpolation of Contouring, Application of contours.	4hrs
Unit 3	Theodolite Surveying Introduction, Study of 20" Vernier transit Theodolite, Use of Theodolite for measurement of horizontal angles by repetition and reiteration method, deflection angles, magnetic bearing, prolonging a Straight line. Fundamental axes. Theodolite Traversing: Computations of consecutive and Independent coordinates. Latitude and Departure, Closing Errors, Balancing the Closed traverse by Bowditch's and Transit Rules, Gales Traverse table, omitted measurement, area calculations.	4hrs



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Unit 4	Tacheometry Introduction, Instrument, applications, Principle of Stadia, fixed hair method with vertical staff to determine horizontal distances and elevations of points, Determination of tacheometric constants. Tacheometric contouring.	4hrs
Unit 5	Curves: Introduction, classification of curves, simple circular curves, Definitions and Notations. Linear and Angular methods, (Rankine's method of deflection angles). Numerical on simple circular curves, Transition curves: necessity and types.	4hrs
Unit 6	Modern Surveying Techniques Total Station- Components, Functions and uses, Electronic Distance Measurement (EDM), Global Positioning System (GPS)- Introduction, Components, Applications of GPS in Civil Engineering. Differential Global Positioning System (DGPS).	4hrs

Sr. No.	Textbooks
1.	T. P. Kanetkar and S.V.Kulkarni, "Surveying and Levelling Vol. I and Vol. II", Pune Vidyarthi Griha Prakashan.
2.	Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, "Surveying" Vol. I, Laxmi Publications
3.	S. K. Duggal, "Surveying", Vol. I & II, Tata Mc-Graw Hill.
Reference Books	
1.	A. M. Chandra, "Plane Surveying", New Age International, Publishers.
2.	N. N. Basak, "Surveying and Levelling", Tata McGraw Hill.
Web Resources	
1.	https://nptel.ac.in/courses/105107122
2.	https://onlinecourses.swayam2.ac.in/nou24_ce11/preview



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Course Title: Engineering Economics		
Course Code: CE253703		Course Category: HSSM-EEMC
Teaching Scheme	Examination Scheme	
Lectures: 02 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester III)	ESE	60 Marks
Course Prerequisite: Basic Mathematics		
Course Description: This course equips second-year civil engineering students with the financial analytical tools needed to evaluate the economic viability of infrastructure projects. It bridges technical design with economic reality by covering foundational principles, the Indian Economy, and market mechanics through demand, supply, and cost analysis. Students gain critical quantitative skills in the time value of money and depreciation and make data-driven decisions that ensure projects are both structurally sound and cost-effective.		
Course Objectives: 1. To equip students with the ability to evaluate the economic feasibility of civil engineering projects using the time value of money and depreciation methods. 2. To provide an understanding of how the Indian economy, demand-supply dynamics, and cost structures influence the viability of infrastructure development. 3. To enable students to perform cost analysis and break-even evaluations to ensure the most efficient allocation of resources in engineering design and construction.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Recall fundamental definitions of economics, laws of market dynamics, interest components, depreciation methods, cost categories, and characteristics of the Indian economy.	Remember (Level 1)
CO2	Explain the concepts of engineering economics, elasticity, time value of money equivalence, maintenance types, cost estimation techniques, and market structures.	Understand (Level 2)
CO3	Calculate the time value of money, break-even points, depreciation and cost sheet using standard mathematical methods.	Apply (Level 3)
CO4	Analyze project investment alternatives, asset replacement decisions, cost-reduction strategies, and structure of Indian Economy.	Analyze (Level 4)



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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	1	1	-	-	2	1	2	1	2
CO2	1	1	-	-	-	2	1	-	-	2	1	2	2	2
CO3	2	2	1	-	1	1	-	-	-	3	1	3	1	1
CO4	1	3	2	2	-	2	2	2	2	3	2	3	2	2

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Introduction to Engineering Economics: Basic economic principles and concepts, Overview of engineering economics and its importance in decision-making, Definition of economics, nature of the economic problem, Micro and macroeconomics: features and scope, Economic Analysis and its role in Project Management.	4 Hrs.
Unit 2	Demand and Supply Analysis: Demand analysis: individual and market demand, law of demand, elasticity of demand, factors influencing demand, Supply analysis: law of supply, Elasticity of supply, role of demand & supply in price determination, Break-even analysis.	4 Hrs.
Unit 3	Time value of money: Simple and compound interest, calculation time value equivalence, economic equivalence, Cash flow diagrams, Present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, Cost dominated cash flow diagram), payback period method, rate of return method.	4 Hrs.
Unit 4	Depreciation: Depreciation – Introduction, Straight line method of depreciation, Declining balance method of depreciation, Sinking fund method of depreciation/Annuity method of depreciation, Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset.	4 Hrs.
Unit 5	Cost analysis: Cost concepts in engineering projects: fixed costs, variable costs, direct costs, indirect costs, sunk cost. Methods of cost estimation: historical data, analogy, parametric estimation. Product and Process costing, Standard costing, Cost Estimation, Cost control and cost reduction technique, Cost sheet.	4 Hrs.



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Unit 6	Indian Economy: Nature and characteristics of the Indian economy, privatization, globalization, Elementary concept of WTO & TRIPS agreement, Monetary Policy & Fiscal Policy, Market types: perfect competition, monopoly, oligopoly, monopolistic competition, Housing Finance and role of NHB, Technical Valuation Report.	4 Hrs.
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Sr. No.	Textbooks
1.	Engineering Economics by R. Panneerselvam
2.	Engineering Economics and Costing by Sasmita Mishra
3.	Engineering Economics & Costing by Anil Kumar Mukhopadhyay
Reference Books	
1.	Riggs., Dedworth, Bedworth, D.B. Randhawa, S.U. "Engineering Economics", Vol.1, Latest Edition, McGraw Hill International, 1996.
2.	James L. Riggs, David D. Bedworth, Sabah U. Randhawa, "Economics for Engineers", Vol.1, 4 th Edition, McGraw- hill, 2004.
3.	Donald Newnan, Ted Eschembach, Jerome Lavelle, "Engineering Economics Analysis", Vol. 18 th Edition, Oxford University Press, 2012.
4.	John A. White, Kenneth E. Case, David B. Pratt, "Principles of Engineering Economics Analysis" Vol. 1, 6 th Edition, John Wiley, 2010.
6.	Micheal R. Lindeburg, "Engineering Economics Analysis", Vol. 1 Latest Edition, Professional Publications, 1993.
7.	V. Mote, S. Paul, G. Gupta, "Managerial Economics", Vol. 1, Latest Edition, Tata McGraw Hill, 2004.
Web Resources	
1.	NPTEL- https://youtu.be/-5q7RB1GWEA?si=AMf0DTPAN-snvvki
2.	NPTEL NOC -IITM - https://youtu.be/BrTpmWuFVxI?si=0bFv1hY4IS7DeQq4



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Course Title: Universal Human Values II**Course Code: GE253704****Course Category: HSSM-VEC**

Teaching Scheme	Examination Scheme	
Lectures: 02 hrs. / Week	CA-1	10 Marks
Tutorial: -	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester III)	ESE	60 Marks
Course Prerequisite: Universal Human Values I		
Course Description: This course introduces the fundamentals of value education , focusing on self-exploration, human aspirations, and continuous happiness. It emphasizes harmony within the individual, in relationships, society, and nature. The course develops understanding of human values, ethics, and professional responsibility . It encourages students to adopt a holistic and sustainable approach to life and decision-making. Learners are guided to apply these values in personal and professional contexts.		
Course Objectives: 1. Explain the concept of value education, self-exploration, and the relationship between happiness, prosperity, and basic human aspirations. 2. Distinguish between the needs of self and the body and apply methods to achieve harmony within the individual and between the self and the body. 3. Demonstrate understanding of harmony in the family and society by applying foundational values such as trust and respect in human relationships. 4. Analyze the interconnectedness and mutual fulfilment among the four orders of nature and relate it to sustainable living and coexistence. 5. Apply a holistic understanding of human values to professional ethics, decision-making, and strategies for value-based life and profession.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Define the concepts of value education, human aspirations, harmony in human beings, family, society, nature and professional ethics.	Remember (Level 1)
CO2	Explain the role of self-exploration, human values, relationships and harmony in achieving continuous happiness and prosperity.	Understand (Level 2)
CO3	Demonstrate the interrelationship among human beings, society, nature and ethical conduct for universal human order.	Apply (Level 3)
CO4	Distinguish the human values and professional ethics in personal and professional life.	Analyze (Level 4)

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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1						2	3	1			3			
CO2						2	3	2			3			
CO3						3	3	2			2			
CO4						3	3	3			3			

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test
CA-2 (b)	Subjective Test / Assignment/ MCQ Test
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity, the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity, Current Scenario, Method to Fulfill the Basic Human Aspirations.	4 Hrs.
Unit 2	Harmony in the Human Being Understanding human beings as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, Harmony of the Self with the Body, self-regulation, and Health.	4 Hrs.
Unit 3	Harmony in the Family and Society: Harmony in the Family, the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect'– as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order	4 Hrs.
Unit 4	Harmony in Nature (Existence) Understanding Harmony in Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.	4 Hrs.
Unit 5	Implications of Holistic Understanding Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order.	4 Hrs.
Unit 6	Value-Based life and Professional Practices Competence in Professional Ethics- Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.	4 Hrs.



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Sr. No.	Textbooks
1.	A Foundation Course in Human Values and Professional Ethics R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.
2.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
Sr. No.	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)
Sr. No.	Web Resources
1.	https://uhv.org.in/UHV-II_Course_Material



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Course Title: Mechanics of Solids and Concrete Technology Lab**Course Code: CE253205****Course Category: PCC**

Teaching Scheme	Examination Scheme	
Practical's/Sessions: 02 Hours/Week	CA-1	15 Marks
Credits: 01	CA-2	15 Marks
Semester: Second Year (Semester III)	ESE	20 Marks

Course Prerequisite

- Engineering Mechanics (Force systems, stress-strain concepts)
- Properties of Engineering Materials
- Measurement techniques and use of laboratory instruments
- Fundamental mathematics for engineering analysis
- Student should have the basic knowledge about concrete technology theory

Course Description:

The Mechanics of Solids Lab introduces students to experimental methods used to determine the mechanical properties of engineering materials. The course focuses on practical evaluation of material behavior under different loading conditions such as tension, shear, torsion, compression, bending, and impact. Students perform standard laboratory tests using universal testing machines and specialized equipment to analyze stress-strain relationships, elastic properties, failure mechanisms, and structural behavior of materials such as mild steel, aluminum, brass, concrete, timber, and tiles. The course helps bridge the gap between theoretical concepts and real-world engineering applications.

This course covers the fundamental principles of Concrete Technology, including the properties of cement, aggregates, water, and admixtures, as well as concrete mix design, fresh and hardened concrete behavior, and durability aspects. It focuses on understanding workability, strength development, testing methods, and quality control practices. The course also emphasizes modern developments such as supplementary cementitious materials, sustainable concrete practices, and special concretes.

Course Objectives:

1. Understand the experimental procedures used to determine mechanical properties of engineering materials.
2. Demonstrate laboratory testing methods such as tension, compression, torsion, shear, and impact tests.
3. Operate material testing equipment, record measurements, and relate results to strength of materials theory.
4. The objective of this course is to understand the characteristics and behavior of civil engineering materials used in buildings and infrastructure.
5. Students will learn standard principles and procedures to design, prepare and/or test materials such as concrete mix design including field test methods for fresh concrete.
6. Know how to select materials based on their properties and their proper use for a particular facility under prevailing loads and environmental conditions.

Note: - The Course Outcomes (COs) and the corresponding CO-PO mapping for this laboratory course are aligned with and detailed in the respective Theory Course Syllabus.

Assessment	
CA-1 (a)	Practical Performance and Evaluation
CA-2 (b)	Practical Performance and Evaluation
ESE (c)	Practical & Oral Examination



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Sr. No.	List of Experiments
1.	To evaluate the tensile properties of mild steel using the tension test for examining its behaviour under axial tensile loading.
2.	To determine the shear strength of mild steel and aluminum using the shear test for analyzing their behaviour under single and double shear conditions.
3.	To investigate the torsional properties of mild steel using the torsion test for studying its behaviour under twisting moments.
4.	To analyze the deflection characteristics of mild steel using the deflection test for observing its behaviour under applied loading.
5.	To evaluate the impact strength of brass and aluminum using the impact test for assessing their toughness under sudden loading conditions.
6.	To measure the compressive strength of concrete cubes using the compression test for assessing the load-bearing capacity of concrete.
7.	To inspect the flexural strength of a timber beam using the flexure test for examining its bending behaviour under transverse loading.
8.	To verify the flexural strength of flooring tiles using the flexure test for assessing their resistance to bending and breaking loads.
9.	To determine the specific gravity, fineness, soundness, normal consistency, setting time, and compressive strength of cement for evaluating its suitability and quality in concrete production.
10.	To evaluate the properties of fine aggregate using tests such as specific gravity, bulking, sieve analysis, fineness modulus, moisture content, bulk density, voids, and deleterious materials for assessing its grading and performance in concrete.
11.	To assess the characteristics of coarse aggregate through specific gravity, sieve analysis, fineness modulus, bulk density, for determining its suitability in structural concrete.
12.	To analyze the workability of fresh concrete using slump cone test and compaction factor tests for ensuring proper handling, placement, and compaction.
13.	To measure the mechanical properties of hardened concrete using compressive strength, split tensile strength, flexural strength, for evaluating structural performance.
14.	To design a concrete mix as per IS 10262:2009 method for achieving the desired strength, and workability requirements.



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Sr. No.	Textbooks
1.	R.K. Bansal., Strength of Materials
2.	R.K. Gupta, Mechanics of Materials
3.	V. Raghavan, Materials Science and Engineering
4.	Concrete Technology (Theory & Practice) by M.S. Shetty, published by S. Chand and Co.
5.	Concrete Technology by M.L. Gambhir, published by Tata McGraw Hill
6.	Concrete technology by A. M. Neville, J.J. Brooks, Pearson
	Reference Books
1.	Lionel S. Marks, Standard Handbook for Mechanical Engineers — McGraw-Hill.
2.	Properties of Concrete by A. M. Neville, Longman Publishers.
3.	Concrete Technology by A. R. Shantakumar, Oxford University Press, 2018
4.	Concrete Technology by R.S. Varshney, Oxford and IBH.
5.	Durability Design of Concrete Structures, by A. Sarja and E. Vesari, E & FN Spon Publication, 1996.
6.	Concrete Mix Design by A. P. Remideos, Himalaya Publishing House.
	Web Resources
1.	NPTEL Courses, https://nptel.ac.in/courses/112107147
2.	Virtual Labs by Ministry of Education (India), https://www.vlab.co.in/
3.	https://onlinecourses.nptel.ac.in/noc25_ce10/preview
4.	https://cs-iitd.vlabs.ac.in/List of experiments.html .



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Course Title: Surveying Lab
Course Code: CE253206

Course Category: PCC

Teaching Scheme

Examination Scheme

Practical's/Sessions: 02 Hours/Week

CA-1

15 Marks

Credits: 01

CA-2

15 Marks

Semester: Second Year (Semester III)

ESE

20 Marks

Course Prerequisite:

- Applied Engineering- Basic knowledge of Civil Engineering Field
- Basic Mathematics- Knowledge of Algebra and Trigonometry

Course Description: Students learn techniques for gathering field data with both traditional and modern instruments. Surveying Lab offers additional experience in fundamental land surveying measurement methods for surveying courses, including precision steel taping methods to perform horizontal measurements, digital theodolites to perform angular measurements and traditional and automatic levels for elevation measurements. Furthermore, students have opportunity to use total station equipment, which enables horizontal, vertical and angular measurements to be made in one operation.

Course Objectives:

1. To familiarize students with various surveying and levelling instruments and demonstrate their proper use in practical fieldwork.
2. To guide students in collecting, compiling, and analyzing surveying data for various civil engineering projects.
3. To introduce students to modern surveying instruments, technologies, and techniques used for accurate map preparation and surveying applications.

Note: - The Course Outcomes (COs) and the corresponding CO-PO mapping for this laboratory course are aligned with and detailed in the respective Theory Course Syllabus.

Assessment

CA-1 (a) Practical Performance and Evaluation

CA-2 (b) Practical Performance and Evaluation

ESE (c) Practical & Oral Examination

Sr. No.

List Of Experiment

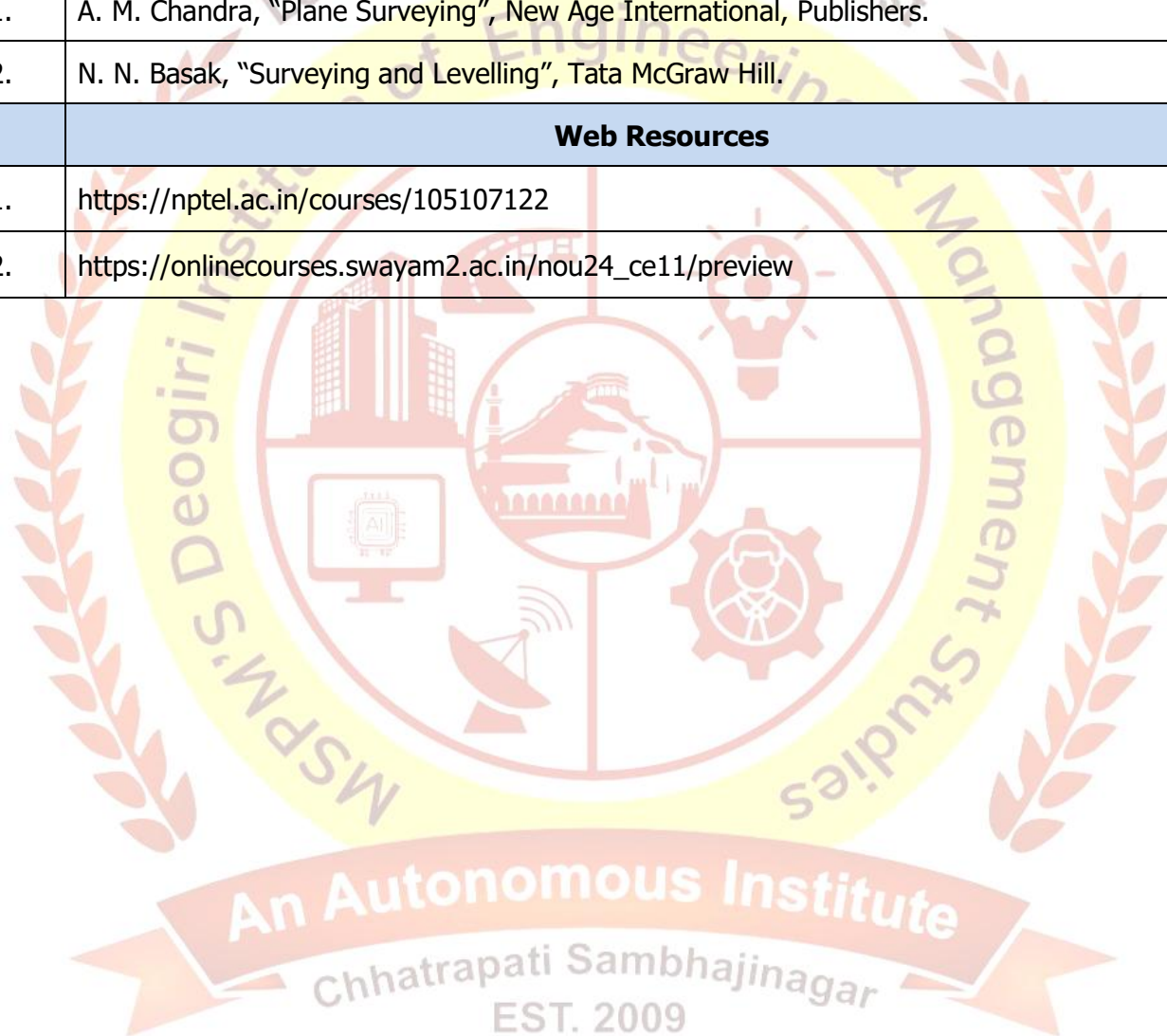
1. To Measure Fore Bearing and back bearing using prismatic compass for a closed traverse of 5 to 6 sides and correct the bearings and included angles.
2. To Use Radiation Method and intersection method of plane table survey to Prepare plans and locate details of area.
3. To Determine Reduced Level of a points using Auto level by Height of Instrument Method.
4. To Measure Horizontal angle by using Transit Theodolite by method of Repetition.
5. To Measure of vertical angles by vernier transit theodolite.
6. To Find horizontal distance and vertical elevation using a Tacheometer.
7. To setting out simple circular curve by Rankines method of deflection angle using theodolite.
8. To Determine horizontal, vertical distances and elevation of points using Total station equipment on ground.

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	Project I: Road project using Auto level including fixing of Alignment with at least one circular curve, Profile levelling, Cross-sectioning, Plotting of L-Section and Cross Section. Project II: Traversing using a total station.
--	---

Sr. No.	Textbooks
1.	T. P. Kanetkar and S.V.Kulkarni, "Surveying and Levelling Vol. I and Vol. II", Pune Vidyarthi Griha Prakashan.
2.	Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, "Surveying" Vol. I, Laxmi Publications
3.	S. K. Duggal, "Surveying", Vol. I & II, Tata Mc-Graw Hill.
Reference Books	
1.	A. M. Chandra, "Plane Surveying", New Age International, Publishers.
2.	N. N. Basak, "Surveying and Levelling", Tata McGraw Hill.
Web Resources	
1.	https://nptel.ac.in/courses/105107122
2.	https://onlinecourses.swayam2.ac.in/nou24_ce11/preview



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Civil Engineering

Course Title: Professional Development III
Course Code: CE253603

Course Category: SC-SEC

Teaching Scheme	Examination Scheme	
Practical: 02 hrs. / week	CA-1	15 Marks
Credits: 01	CA-2	15 Marks
Semester: Second Year (Semester III)	ESE	20 Marks

Course Prerequisite: Basic Computer Literacy, Mathematical Knowledge, Keyboard Skills.

Course Description: This course introduces students to essential office productivity tools used for professional documentation, presentations, and data management. Students will learn to create and format documents using word processing software, design effective presentations using presentation tools, and organize and analyze data using spreadsheet applications. The course emphasizes hands-on practice with features such as formatting, charts, data validation, pivot tables, and spreadsheet functions. Through practical exercises, students will develop skills in preparing professional documents, visual presentations, and structured data sheets. The course is important for improving digital literacy and enabling students to efficiently handle academic, professional, and workplace documentation tasks.

Course Objectives:

1. To introduce students to the fundamental features and tools of office productivity software used for document preparation, presentations, and spreadsheet management.
2. To provide practical exposure to creating, formatting, and presenting professional documents and presentations using appropriate digital tools.
3. To familiarize students with spreadsheet techniques for organizing, managing, and visualizing data using charts, tables, and formatting tools.
4. To develop digital competency by training students in spreadsheet functions, data validation, pivot tables, and other tools for efficient data handling and analysis in academic and professional environments.

Course Outcomes:

CO	After completion of the course students will be able to	Bloom's Level
CO1	Recall fundamental concepts, features, and interfaces of office productivity tools including word processing, presentation software, spreadsheets, and professional email communication.	Remember (Level 1)
CO2	Explain the working principles, functionalities, and best practices of word processing, presentation design, spreadsheet operations, and email writing etiquettes for professional communication.	Understand (Level 2)
CO3	Apply office productivity tools to create structured documents, professional emails, effective presentations, and organized spreadsheets using appropriate features and formatting techniques.	Apply (Level 3)
CO4	Analyze and interpret data using spreadsheet techniques such as charts, validation, pivot tables, and functions to support information processing and decision-making in real-world scenarios.	Analyze (Level 4)



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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
CO1	1	1	-	-	2	-	-	-	1	-	1	1	-	-
CO2	1	1	-	-	2	-	1	-	2	-	1	1	-	-
CO3	2	1	1	-	3	-	1	1	3	1	1	1	1	1
CO4	3	3	1	2	3	-	-	1	2	1	2	2	1	2

Assessment	
CA-1 (a)	Performance & Evaluation of activities on word & Presentation Module.
CA-2 (b)	Performance & Evaluation of activities on spreadsheet Module
ESE (c)	Viva-voce/Activity Evaluation of different module.

Sr. No.	List of Activities
1.	To explore word processor interface and navigation tools for efficient document handling and professional drafting.
2.	To apply basic text entry and formatting tools in word processor for creating structured documents.
3.	To apply advanced formatting techniques for consistency and improved presentation of created report.
4.	To create presentations using slides, themes, and multimedia elements for effective communication.
5.	To analyze and modify presentation designs using software tools for improving visual impact.
6.	To perform data entry and worksheet formatting in spreadsheet software for organized data management.
7.	To apply conditional formatting and create charts in spreadsheets for data visualization.
8.	To implement data validation and filtering techniques in spreadsheets for accurate data analysis.
9.	To generate pivot tables using spreadsheet tools for summarizing and analyzing large datasets.
10.	To apply spreadsheet functions (text, date-time, mathematical, statistical, and logical) for data processing and decision-making.
11.	To explore email significance, navigation tools and Id creation to inculcate essential principles.
12.	To compose professional emails using proper email writing etiquettes for effective workplace communication.



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Sr. No.	Textbooks
1.	Abigail Rusu, Andrea Long, Heather Maye, Jennifer Evans, Amy Ledgerwood, and Jeanine Preuss, Introduction to Microsoft Office, Maricopa Millions Grant.
2.	Helen Holding, Clare Martin, Mastering Microsoft Office, Red Globe Press.
3.	R. P. Soni, Harshal Arolkar, Sonal Jain, Working with Personal Computer Software, Wiley India.
Sr. No.	Reference Books
1.	Stephanie Krieger, Documents, Presentations, and Workbooks: Using Microsoft Office to Create Content That Gets Noticed, Microsoft Press.
2.	Marjorie S. Hunt, Barbara Clemens, Illustrated Microsoft Office 365 & Office 2016, Cengage Learning.
3.	Linda Foulkes, Learn Microsoft Office 2019, Packt Publishing.
Sr. No.	Web Resources
1.	Step-by-step learning resources for office software, https://www.tutorialspoint.com/word https://www.tutorialspoint.com/excel https://www.tutorialspoint.com/powerpoint
2.	Spreadsheet concepts and functions tutorials, https://www.w3schools.com/excel



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Course Title: Do It Yourself III**Course Code: CE253805****Course Category: ELC**

Teaching Scheme	Examination Scheme	
Practical: 02 hrs. / week	CA-1	15 Marks
Credits: 01	CA-2	15 Marks
Semester: Second Year (Semester III)	ESE	20 Marks
Course Prerequisite: Basic knowledge of surveying, engineering drawing, building components, and measurement tools such as measuring tape, plumb bob, spirit level, and total station.		
Course Description: This course develops practical skills in surveying and building measurement. Students learn the use of modern surveying instruments like total station along with field measurement of building components. The course also focuses on preparation of accurate engineering drawings based on field observations and collected data.		
Course Objectives: 1. To introduce surveying instruments and building measurement tools used in civil engineering practice. 2. To develop skills in operating total station and conducting field measurements. 3. To develop the ability to measure building components and record field data accurately. 4. To develop skills in preparing engineering drawings based on field measurements.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	List the components and functions of surveying instruments and building measurement tools.	Remember (Level 1)
CO2	Describe the working principles and applications of total station and basic measuring tools.	Understand (Level 2)
CO3	Implement the field measurement techniques to collect, record, and organize data of building components accurately for documentation.	Apply (Level 3)
CO4	Analyze measured field data to develop accurate engineering drawings.	Analyze (Level 4)

CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	-	-	2	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	3	-	-	-	-	-	-	3	1	-
CO3	3	2	1	2	3	-	-	2	1	-	-	3	2	2
CO4	3	3	2	3	2	-	-	-	2	-	1	3	2	3



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Assessment	
CA-1 (a)	Practical Performance and Evaluation
CA-2 (b)	Practical Performance and Evaluation
ESE (c)	Practical & Oral Examination

List of Activities	
1	Introduction to surveying instruments and total station.
2	Demonstration of total station components and functions.
3	Setting up and orientation of total station in field.
4	Measurement of Distance, horizontal and vertical angles using total station.
5	Area measurement and coordinate recording using total station.
6	Data downloading and processing from total station.
7	Introduction to building measurement tools and techniques.
8	Measurement of building components such as footing, plinth beam, walls, doors & windows.
9	Preparation of drawings of measured building components.
10	Measurement of building layout and staircase.
11	Preparation of drawings of measured building components.
12	Prepare and Submit detailed engineering drawings in the prescribed format for departmental approval and sanction.

Sr. No.	Textbooks
1.	T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling Vol I & II, Pune Vidyarthi Griha Prakashan.
2.	S. K. Duggal, Surveying Vol I & II, Tata McGraw Hill.
3.	M. G. Shah, C. M. Kale and S. Y. Patki, Building Drawing, Tata McGraw Hill.
Reference Books	
1.	A. M. Chandra, Plane Surveying, New Age International.
2.	B. C. Punmia, Surveying Vol I, Laxmi Publications.
3.	B. P. Verma, Civil Engineering Drawing and House Planning, Khanna Publishers.
Web Resources	
1.	https://nptel.ac.in/courses/105107122
2.	https://onlinecourses.swayam2.ac.in
3.	https://bis.gov.in (National Building Code)



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Course Title: PBL III: Problem Based Learning**Course Code: CE253806****Course Category: ELC**

Teaching Scheme	Examination Scheme (As Applicable)	
Practicals/Sessions: 02 Hours/Week	CA-I	15 Marks
Credits: 01	CA-II	15 Marks
Semester: Second Year (Semester III)	ESE	20 Marks

Course Prerequisite: Use of analytical skills and drawing tools, Design Thinking Module.

Course Description: This course enables students to learn engineering concepts through solving real-world course related technical problems at detailed project level. It emphasizes application of domain knowledge, critical thinking, and systematic problem-solving. In this course students will remain engaged in need identification, solution development, prototyping, and validation within given constraints. The course promotes teamwork and hands-on learning. Outcomes are demonstrated through a representational prototype of proposed solution along with detailed documentation. The course coordinators will guide to the students in the journey of problem solving by providing the resources in the lab activity sessions and also monitor the students progress.

Course Objectives:

1. To enable students to apply domain knowledge for solving real-world course related technical problems through a structured problem-based learning approach.
2. To guide students in analyzing problems, generating feasible solutions, and making informed engineering decisions.
3. To facilitate the development of design, implementation, and testing skills through project-based activities.
4. To cultivate teamwork, communication, and professional skills through continuous mentoring and evaluation.

Course Outcomes:

COs	After completion of the course: Student will be able to	Bloom's Level
CO1	Understand real-world engineering problems by identifying basic requirements, limitations, and relevant knowledge.	Understand (Level 2)
CO2	Apply engineering concepts, tools, and methods to develop a working solution.	Apply (Level 3)
CO3	Analyze engineering problems by connecting theory with practical situations and finding possible solution approaches.	Analyze (Level 4)
CO4	Evaluate different engineering solutions based on factors like feasibility, cost, efficiency, and sustainability.	Evaluate (Level 5)
CO5	Create and present engineering solutions by testing performance and explaining results clearly.	Create (Level 6)

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CO-PO-PSO Mapping:

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2		1								2		2
CO2	3	2	2	2	2			2			1	3		2
CO3	3	3	3	1	1			2			1	3		2
CO4	2	2	3	2	2	1		1			1	3		3
CO5			3		2			3	2	2	2			

Assessment	
CA-I (a)	Identify a real-life problem related to your subject. Clearly explain the problem, understand the needs of users, and list the important constraints (such as cost, materials, and time). Study existing solutions for the same problem. Then, generate different possible solutions and select the best one based on practicality, cost, and effectiveness.
CA-II (b)	Based on the selected solution, design and build a representational model of prototype. Prepare a proper plan, use suitable tools and methods to develop it. Make improvements if needed, and finally demonstrate the representational model with clear documentation.
ESE (c)	Assigned Task Completion.

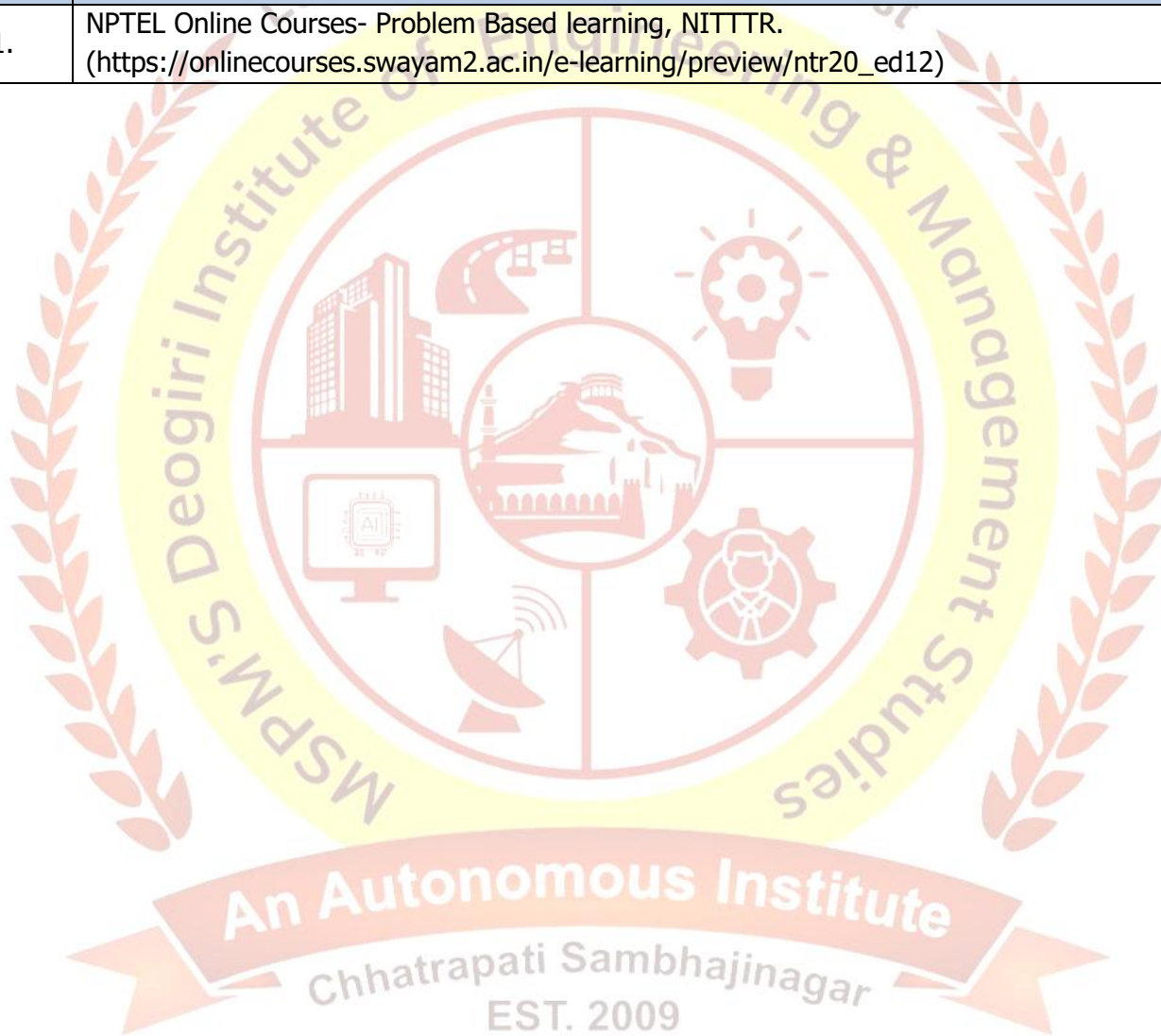
Sr. No.	List of Experiments/Activities
1.	To identify a course-related technical problems.
2.	To define the problem clearly with objectives, basic requirements, and constraints.
3.	To study existing solutions or methods related to the problem and find the gap
4.	To generate different possible solutions using basic engineering concepts.
5.	To select the best solution based on different applicable criteria's i.e. feasibility, simplicity, and cost-effectiveness.
6.	To prepare the design, list of materials and use the required tools for the solution.
7.	To develop a basic representational model of prototype using available resources.
8.	To test the developed solution based on the peer-reviewed feedback.
9.	To improve the solution based on test results and feedback.
10.	To present the final solution and prepare a simple technical report.



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Sr. No.	Textbooks
1.	Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Berg Publishers.
2.	Nigel Cross, Engineering Design Methods: Strategies for Product Design, John Wiley & Sons.
Sr. No.	Reference Books
1.	Guerra, Aida, Ulseth, Ronald, Kolmos, Anette, PBL in Engineering Education: International Perspectives on Curriculum Change, Springer, 2017.
Sr. No.	Web Resources
1.	NPTEL Online Courses- Problem Based learning, NITTTR. (https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr20_ed12)



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Course Title: Environmental Impact Assessment
Course Code: CE253501

Course Category: OE I

Teaching Scheme	Examination Scheme	
Lectures: 04 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 04	MSE	20 Marks
Semester: Second Year (Semester III)	ESE	60 Marks
Course Prerequisite: - Foundational background in environmental science - Basics of Environmental Engineering.		
Course Description: This course covers Need of Environment impact assessment of developmental projects, EIA notification 1994, list of projects require environmental clearance. Environment protection act 1986, It focuses on EIA guidelines, Key Regulatory authorities, MOEF, SEIAA, SEAC, CPCB, CGWB, water pollution and control act, air pollution and control act, This course also includes stages in EC process, Basic information required for EIA report, check list of Environment impacts. This course also focuses on EIA Methodology, ISO 14000, Environment Management Plan.		
Course Objectives: - To understand the fundamental concepts and significance of Environmental Impact Assessment (EIA). - To familiarize students with EIA guidelines, procedures, and legal frameworks. - To study the roles and responsibilities of key environmental regulatory authorities such as MoEFCC, SEIAA, SEAC, CPCB, and CGWB. - To identify and analyze projects that require prior Environmental Clearance. - To develop knowledge of various EIA methodologies and impact assessment techniques. - To introduce ISO 14000 standards and their application in environmental management.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	State Environment Impact Assessment process and legal framework of Environmental Impact Assessment (EIA).	Remember (Level 1)
CO2	Identify projects requiring Environmental Clearance and roles of key regulatory authorities.	Understand (Level 2)
CO3	Describe EIA methodologies and Environmental impacts of development projects.	Apply (Level 3)
CO4	Illustrate EIA report and environmental management plans	Apply (Level 3)



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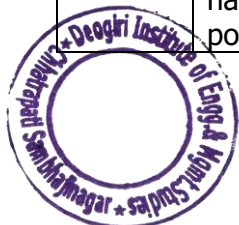
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CO-PO-PSO Mapping

CO-PO Mapping											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	1	-	-	-	-	-	1	1
CO2	3	2	-	-	-	-	-	-	-	-	1
CO3	3	2	-	1	-	-	-	-	-	1	1
CO4	3	2	-	1	-	-	-	-	-	-	1

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	EIA of Developmental Projects in India Introduction, The Need for EIA, History of EIA in India, Definition and scope, EIA notification 1994, Polluting development Projects needing environmental clearance under EIA Notification 1994, India's EIA notification-2006, Category A Projects, Category B projects. Types of EIA, Environment protection Act 1986, Roll of Qualified Building Environmental Auditor and Environment cell.	10 Hrs.
Unit 2	Regulatory Authority of State and Central government Key Regulatory authorities- MOEF, SEIAA, SEAC, MPCB, CPCB, CZMA, CGWB. Water Pollution Act, Air Pollution Act, Waste Water disposal standards, ETP, STP, List of projects requiring prior Environment clearance, Category of the Projects, Category A projects, category B projects, Mining of Minerals.	8 Hrs.
Unit 3	Stages in Environmental Clearance Screening, Scoping, Public consultation, Appraisal, Prior Environment clearance process, grant or rejection of EC, Validity of EC, Validity of EC, Post EC monitoring, Transfer ability of EC,	6 Hrs.
Unit 4	Projects category with threshold limit Mining minerals, offshore and onshore oil and gas exploration, river valley projects, Thermal Power plant, Metallurgical industries, Cement Plants, Coke oven plants, Leather or hide processing industry, chemical fertilizer industry, Pulp and paper industry, building and construction projects, NGT, MOUD, building by laws and rules, physical infrastructure including Environmental services. General condition for category B projects, Special condition.	10 Hrs.
Unit 5	Basic information of projects for EIA Project details, Activity, project involving actions, physical change in locality, use of natural resources, use of hazardous material, production of solid waste, release of pollutant or toxic substance to air, generation of noise and vibration, risk of	10 Hrs.



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	contamination of land, water from release of pollutants in ground or sewer, risk of accidents at projects, factor affecting environment, Environmental sensitivity, Check list for Environmental Impacts.	
Unit 6	Environment Management Plan and Monitoring ISO 14000, Environmental Management Plan, Post project management Plan, Disaster management Plan	4 Hrs.

Sr. No.	Textbooks
1.	Santosh Kumar Garg, Environmental Engineering-II, Sewage Disposal and Air Pollution Engineering, KHANNA PUBLISHERS,
2.	Rau J.G. and Wooten D.C. Environment impact Assessment, McGraw Hill Pub. Co. New york, 1996.
3.	Wathern. P Environmental Impact Assessment- Theory and Practice, Routledge Publishers, London, 2004.
4.	Jain, R.K., Urban, L.V. and Stacey, G.S., Environment Impact Analysis, Von Nostrand Reinhold Company.
5	Lawrence, David P., Environmental Impact Assessment (Practical Solutions to Recurrent Problems), Wiley International, New Jersey. .
6	M.N.rao, A.K.Datta., Waste Water Treatment
7	Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002.
Sr. No.	Reference
1.	MoEF, GoI, Environment Impact Assessment, Impact Assessment Division, January 2001 (Manual).
2.	Water (Prevention and Control of Pollution) Act 1974. Air (Prevention and Control of Pollution) Act 1981.
3.	Trivedi, P.R., Natural Resources Conservation, APH Publishing Corporation, New Delhi.
4.	Westman, Walter E., "Ecology, Impact Assessment and Environment Planning" John Wiley and Sons, Canada, 1985.
Sr. No.	Web Sources
1.	http://www.eia.gov
2.	http://www.moef.in



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Course Title: Experimental Stress Analysis**Course Code: CE253502****Course Category: OE I**

Teaching Scheme	Examination Scheme	
Lectures: 04 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 04	MSE	20 Marks
Semester: Second Year (Semester III)	ESE	60 Marks
Course Prerequisite: - Strength of Materials / Mechanics of Materials - Engineering Mechanics (Statics & Dynamics) - Basic Mathematics (Differential Equations, Linear Algebra, Calculus) - Engineering Drawing (for visualization of stress/strain elements).		
Course Description: This course provides an in-depth understanding of stress and strain analysis in engineering materials. It covers theoretical foundations like Hooke's law, axial, shear, and thermal stresses, as well as practical experimental techniques including strain measurement and photoelasticity. The course bridges analytical, numerical, and experimental approaches.		
Course Objectives: - To understand the fundamental concepts of stress, strain, and mechanical properties of engineering materials under different loading conditions. - To develop analytical skills to determine internal forces, bending moments, and shear forces in structural members subjected to various loads. - To apply mechanics principles to evaluate stresses, strains, and deformations in beams, shafts, and columns subjected to bending, shear, torsion, and axial loads. - To evaluate material failure using different failure theories.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Understand and explain the concepts of stress, strain, and deformation in different engineering materials.	Understand (Level 2)
CO2	Apply strain measurement techniques such as strain gauges, rosettes, and photoelasticity to real-world problems.	Apply (Level 3)
CO3	Analyze axial, shear, bending, and torsional stresses using theoretical and experimental methods.	Analyze (Level 4)
CO4	Evaluate material behavior and safety using failure theories and correlate experimental results with theoretical predictions.	Evaluate (Level 5)



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CO-PO Mapping

CO-PO Mapping											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	1	-	-	-	-	1	-	1
CO2	3	3	2	2	1	1	-	-	1	-	1
CO3	2	2	2	3	3	1	-	1	1	-	2
CO4	3	3	2	3	2	2	1	-	1	-	2

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Concept of Stress and Strain simple stress, shearing stress, bearing stress, diaphragm or skin stresses in thin-walled vessels, statically indeterminate members and thermal stresses. Stress strain diagram for different engineering materials. Hooke's law, axial and shearing deformations, Poisson's ratio, biaxial and tri-axial deformations, variation of stress with inclination of element, relationship between modulus of rigidity and modulus of elasticity, variation of stress at a point.	8 Hrs.
Unit 2	Axial Force, Shear Force and Bending Moment shear force and bending moment over elemental length, Derivation of flexural formula, economic sections, analysis of flexural action, derivation of formula for shearing stress, concept of shear flow, shear lag and shear center, Torsion -Assumptions.	8 Hrs.
Unit 3	Strain Analysis and Stress-Strain Relationships Derivation of Equilibrium conditions in three dimensions, Concept of Strain at a point, Determination of normal and shear strain, problems on interrelationship between stress and Strain in three dimensions.	8 Hrs.
Unit 4	Theories of Failure maximum principal stress theory, maximum principal strain theory, maximum strain energy theory, maximum shear stress theory, maximum shear strain theory	8 Hrs.
Unit 5	Advanced Stress Analysis and Strain Measurement. Derivation of Airy's Stress function using the boundary conditions, equilibrium equations, compatibility conditions solution to stress analysis problems, Torsion of circular shafts, Strain Measurement- Types of Strain gauges, Characteristics of ideal strain gauges, gauge factor, Strain gauge Rosettes.	10 Hrs.



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Unit 6	Introduction to Photoelasticity Introduction to two-dimensional photoelasticity, Stress-Optic law.	6 Hrs.
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Sr. No.	Textbooks
1.	JW Dally and WF Riley, "Experimental Stress Analysis", McGraw-Hill Publications, 2003
2.	Junnarkar S.B. (2014), "Mechanics of Structures", Charotar Publishers, Anand, 31st edition
3.	Khurmi R.S., 2018, "Strength of Material", S. Chand and Co., Edition revised 1968, New Delhi
	Reference Books
1.	Timoshenko S. P. and Goodier J. N. (2010) Theory of Elasticity, 3rd Ed., McGraw Hill., N. Delhi
2.	Abdul Mubeen, "Experimental Stress Analysis", Dhanpat Rai and Sons, 2001
3.	Popov E.P., 2015, "Introduction to Mechanics of Solids", Prentice-Hall, Second Edition 2005
4.	Dr. Sadhu Singh, 1978, "Theory and Solved Problems in Adv. Strength of Materials", ISBN: 978-81-7409-212-7
	Web Resources
1.	NPTEL Course on Experimental Stress Analysis, https://nptel.ac.in/courses/112/106/112106068/
2.	Swayam Course on Experimental Stress Analysis by Prof. K. Ramesh, IIT Madras, https://swayam.gov.in/nd1_noc20_me02/preview .



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Course Title: Composite Materials**Course Code: CE253503****Course Category: OE I**

Teaching Scheme	Examination Scheme	
Lectures: 04 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 04	MSE	20 Marks
Semester: Third Year (Semester III)	ESE	60 Marks
Course Prerequisite: Students should have basic knowledge of Engineering Mechanics, Strength of Materials, and Materials Science. Understanding of stress-strain relationships, elastic properties of materials, and fundamental mechanical behavior of solids is required to analyze the behavior and performance of composite materials. Basic knowledge of matrix algebra and mechanics of materials will also be helpful for studying lamina and laminate analysis.		
Course Description: This course introduces the fundamentals of composite materials, including their classification, characteristics, advantages, and engineering applications. It covers the role of matrix and reinforcement materials, different types of fibers, and their properties. The course also explains the mechanical behavior, micromechanical analysis, and elastic properties of composites, along with lamina and laminate concepts and failure criteria used in laminated composite structures.		
Course Objectives: 1. To introduce students to the fundamentals, classification, and characteristics of composite materials used in modern engineering applications. 2. To develop understanding of reinforcement materials, matrix materials, and their influence on composite behaviour. 3. To analyse the mechanical behaviour and micromechanical properties of composite materials. 4. To apply the principles of laminated composite analysis and failure criteria for engineering design.		

Course Outcomes:

COs	After completion of the course students will be able to:	Bloom's Level
CO1	Understand fundamentals, classification and applications of composite materials	Understand (Level 2)
CO2	Explain different reinforcement materials such as glass, carbon, Kevlar and boron fibers along with their properties and applications.	Understand (Level 2)
CO3	Evaluate micromechanical properties and apply laminated composite analysis including stiffness, stress-strain relations and failure criteria	Analyze (Level 3)
CO4	Analyze the mechanical behavior of composite materials using rule of mixtures, iso-strain and iso-stress conditions.	Apply (Level 4)



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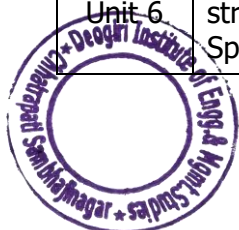
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CO-PO Mapping

CO-PO Mapping											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-
CO4	3	3	2	1	-	-	-	-	-	-	-

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Introduction: Definition – Classification and characteristics of Composite materials. Advantages and applications of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.	8 Hrs.
Unit 2	Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Iso-strain and iso-stress conditions.	8 Hrs.
Unit 3	Advantages and Applications: Advantages of Composite Materials and Structures. Applications and Use of Composite materials in the present world. Basics of Composites: Mechanical Behavior of Composite Materials (rule of mixtures, inverse rule of mixtures, Iso-strain conditions, iso-stress condition). Lamina, Laminate: The basic building block of a composite material.	8 Hrs.
Unit 4	Micromechanical Analysis of Composite Strength and Stiffness Properties of typical composite materials. Volume and Weight Fractions. Longitudinal Strength and Stiffness. Transverse Modulus. In-plane shear Modulus. Poisson's ratio. Elastic Properties of the Unidirectional Lamina Stress-strain relationships. Engineering Constants. Stress-strain relations of a Thin Lamina.	8 Hrs.
Unit 5	Analysis of Laminated Composites, Laminates Basic Assumptions, Strain-Displacement Relationship, Stress- Strain Relationships, Equilibrium Equations, Laminate Stiffness, Determination of Lamina Stresses and Strains.	8 Hrs.
Unit 6	Types of laminate configurations. Laminar failure criteria: Strength ratio Maximum stress criteria Maximum strain criteria Interacting failure criteria, Hygrothermal failure, Special laminates: Balanced laminate, Anti-symmetric laminate	8 Hrs.



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Sr. No.	Textbooks
1.	Composite Materials: Science and Engineering- Krishan K. Chawla
2.	Mechanics of Composite Materials- Autar K. Kaw
3.	Mechanics of Composite Materials- Robert M. Jones
4	Engineering Mechanics of Composite Materials- Isaac M. Daniel & Ori Ishai
5	Composite Materials: Design and Applications- Daniel Gay
	Reference Books
1.	R.W.Cahn, Material Science and Technology – Vol 13 – Composites, West Germany, 1994.. 3,
2	Herakovich C.T., Mechanics of Fibrous Composites, John Wiley & Sons, Inc. New York, 1998.
3	Mukhopadhyay M., Mechanics of Composite Materials and Structures, Universities Press.
4	.WD Callister, Jr., Adapted by R. Balasubramaniam, Materials Science and Engineering, John Wiley & Sons, NY, Indian edition, 2007
5	K.K.Chawla, Composite Materials, 3rd Edition, springer, 2012
6	Deborah D.L. Chung, Composite Materials Science and Applications, 2nd Edition, springer
7	.Jones R.M., Mechanics of Composite Materials, Technomic Publication. Christensen R. M., Mechanics of Composite Materials, Krieger Publishing Company, Florida, USA
8	Agarwal B.D. and Broutman L.J., Analysis and Performance of Fibre Composites, John Wiley & Sons, Inc. New York.
9	Hodgkinson J.M., Mechanical Testing of Advanced Fibre Composites, Woodhead Publishing Limited, Cambridge, 2000
	Web Resources
1.	Introduction to Composite Materials, Mechanics of Composite Material, Advanced Composite Materials NPTEL, https://nptel.ac.in/
2.	Mechanics of Composite Materials-MIT OpenCourseWare- https://ocw.mit.edu/
3.	Coursera – Materials Science Courses- https://www.coursera.org/



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Course Title: Basic Civil Engineering
Course Code: CE253401

Course Category: MDM I

Teaching Scheme	Examination Scheme	
Lectures: 02 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester III)	ESE	60 Marks
Course Prerequisite: - Basic material Knowledge - Fundamental knowledge of natural resources and the water cycle.		
Course Description: An introductory course covering the scope of civil engineering, construction materials, building planning, transportation systems, building construction, foundation types, water management, and environmental engineering. It provides basic knowledge of materials, structural elements, infrastructure planning, and sustainability, forming a foundation for advanced civil engineering studies.		
Course Objectives: - To introduce the basic concepts, scope, and importance of Civil Engineering and various construction materials. - To understand the principles of building planning, orientation, and basic building byelaws. - To study the role of transportation in national development and the classification of roads and railways. - To familiarize students with types of buildings, building components, loads, brick bonds, and building services. - To introduce the concept of foundations, soil as foundation strata, and bearing capacity. - To develop basic knowledge of water management, irrigation systems, and environmental engineering concepts.		

Course Outcomes:

COs	After completion of the course students will be able to	Bloom's Level
CO1	Define the fundamental concepts, terminology, and scope of civil engineering and its related disciplines.	Remember (Level-1)
CO2	Describe the principles, components, and applications of civil engineering materials, systems, and infrastructure.	Understand (Level-2)
CO3	Implement basic civil engineering knowledge and principles to planning, construction, resource management, and environmental practices.	Apply (Level-3)
CO4	Analyze civil engineering systems, problems, and solutions with consideration for functionality, sustainability, and societal needs.	Analyze (Level-4)

CO-PO Mapping

CO-PO Mapping											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	2	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	1
CO3	2	-	2	-	2	2	-	-	-	-	1
CO4	2	3	3	-	-	3	-	-	-	-	3



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Assessment	
CA-1 (a)	Subjective Test / Open book test / Assignment etc.
CA-2 (b)	MCQ test / Assignment / Presentation / etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Introduction to Civil Engineering Materials Introduction, Scope and Role of Civil Engineering, List of materials, Type, Properties, Uses of materials: Cement, Aggregate, Brick, Steel, Concrete, Stone, Soil, Mortar, Timber, Plastic, Fly ash, Steel slag, Bitumen, Pipe, Wire, Cable.	4 Hrs.
Unit 2	Building Planning and Transportation Principles of planning, orientation of buildings, introduction to 'Byelaws' regarding building line, height of building, open space requirements, F.S.I., ventilation, sanitation. Role of transportation in national development, Types of roads: Introductions to NH, SH, MDR, ODR, VR, and Expressway. Cross section of road. Railway: Introduction, Gauges, Cross section.	4 Hrs.
Unit 3	Building Construction and Services Type of building, Component of building and its functions, types of load acting on building, types of brick bonds, typical building layout, Symbol used for water supply, plumbing, and sanitation. Types of building services like plumbing and sanitation, electricity, building finishes.	4 Hrs.
Unit 4	Foundation for Structures Introduction to foundation, Types of foundation and their suitability, Soil type as foundation strata, Concept of bearing capacity, ultimate, safe and presumptive bearing capacity, Shallow foundation and Deep foundations, Modes of failure.	4 Hrs.
Unit 5	Water Management Elementary Hydrology, Sources of Water, Watershed Development, Water conservation, Basic Introduction of Hydraulic Structures: dam, weirs and barrages, Irrigation methods.	3 Hrs.
Unit 6	Environmental Engineering Sources and effects of air pollutants on environmental, Air Pollution control devices. Noise Pollution Sources, Noise characteristics, measurement of noise, Effects of noise, Control of noise. Sources of water and wastewater, water supply and drainage system, characteristics of water and wastewater and process flowchart of water and wastewater treatment, Sustainable solid waste management. Introduction to environmental impact assessment	5 Hrs.



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Sr. No.	Textbooks
1.	Bhavikatti S. S., "Basic Civil Engineering", New Age International (P) Ltd. Publishers, New Delhi.
2.	Punmia B. C., Jain Ashok Kumar, and Jain Arun Kumar, "Building Construction", Laxmi Publications (P) Ltd., New Delhi.
3.	Rangwala S. C., "Engineering Materials", Charotar Publishing House Pvt. Ltd., Anand.
4.	Khanna S. K. and Justo C. E. G., "Highway Engineering", Nem Chand & Bros, Roorkee.
5.	Garg S. K., "Water Supply Engineering (Environmental Engineering Vol. I & II)", Khanna Publishers, Delhi.
	Reference Books
1.	Arora S. P. and Bindra S.P., "Building Construction", Dhanpat Rai and Sons, Delhi.
2.	Punmia B. C., "Soil Mechanics and Foundations", Laxmi Publications (P) Ltd., New Delhi.
3.	Rajvir Singh, "Watershed Planning and Management", Yash Publishing House, Jaipur, India 3rd Edition 2016
4.	Davis Mackenzie L., "Principles of Environmental Engineering and Science", McGraw Hill Education, New York.
5.	Shah, Kale and Patki, "Building Design and Drawing", Tata Mc Graw Hill, New Delhi.
	Web Resources
1.	NPTEL, "Basic Construction Materials", Prof. Manu Santhanam and Prof. Radhakrishna G. Pillai, IIT Madras, https://nptel.ac.in/courses/105106200
2.	NPTEL, "Transportation Engineering – I", IIT Kharagpur. https://nptel.ac.in/courses/105105107
3.	NPTEL, "Environmental Engineering", IIT Roorkee. https://nptel.ac.in/courses/103107084



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Course Title: HMM I

Course Code: CE253207

Course Category: Honors

Teaching Scheme

Examination Scheme

Lectures: 02 hrs. / week

CA-1

10 Marks

Tutorial: --

CA-2

10 Marks

Credits: 02

MSE

20 Marks

Semester: Second Year (Semester III)

ESE

60 Marks

Course Description:

This course shall be offered through the SWAYAM/NPTEL online learning platform. The Board of Studies (BoS) shall identify, approve, and recommend the course based on its relevance to the program curriculum, academic quality, and prevailing industry standards.



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Course Title: DM I

Course Code: CE253208

Course Category: Double Minor

Teaching Scheme	Examination Scheme	
Lectures: 02 hrs./week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester-III)	ESE	60 Marks

Course Description:

This course shall be offered through the SWAYAM/NPTEL online learning platform. The Board of Studies (BoS) shall identify, approve, and recommend the course based on its relevance to the program curriculum, academic quality, and prevailing industry standards.



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Civil Engineering

Course Title: Structural Mechanics I**Course Code: CE254209****Course Category: PCC**

Teaching Scheme	Examination Scheme	
Lectures: 03 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks
Course Prerequisite: - Strength of Materials – Pure bending Equations, basic analysis. - Engineering Mechanics – Force systems and Equilibrium equations - Engineering Mathematics – Derivatives and simple integration.		
Course Description: Structural Mechanics is a fundamental course in Civil Engineering that introduces students to the principles governing the behavior of structural elements under different types of loads. The course focuses on understanding how forces, moments, and stresses act on structures and how these effects influence stability, strength, and safety. Students learn the basic concepts of equilibrium, types of loads, support conditions, and structural responses. The course also introduces analysis of simple structures such as beams, and frames. Emphasis is placed on developing problem-solving skills to determine reactions, Slope, Deflection, shear force, and bending moment in structural members.		
Course Objectives: - To introduce the fundamental concepts of forces, moments, and equilibrium in structural systems used in Civil Engineering. - To develop the ability to analyze different types of loads and support conditions acting on structural members. - To enable students to determine reactions, slope, deflection, shear force, and bending moment in simple structural elements such as beams and trusses. - To provide basic knowledge of stress, strain, and deformation in structural members.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Explain the concept of slope and deflection, determinate and indeterminate beams, continuous beams, portal frames, trusses, fixed beam, and methods for analysis of indeterminate structures	Remember (Level 1)
CO2	Interpret the basic principles of forces, moments, and equilibrium applied to structural systems in Civil Engineering.	Understand (Level 2)
CO3	Draw and interpret Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD), for beams and portal frames and to find internal force component in trusses subjected to various loading conditions.	Apply (Level 3)
CO4	Analyze the statically determinate and indeterminate structures like simple beams, fixed beams, continuous beams, trusses, portal frames subjected to various loading conditions	Analyze (Level 4)



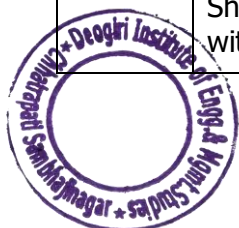
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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	1	1	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1	1	1
CO3	3	3	1	-	-	-	-	-	-	-	-	1	1	1
CO4	3	3	1	-	-	-	-	-	-	-	-	1	1	1

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Beam Deflection Calculations of deflection for determinate beams by double integration, Macaulay's method, moment area method, conjugate beam method, deflection by method of superposition	6 Hrs.
Unit 2	Energy Principles Strain energy and strain energy density, Castiglano's energy theorems, principle of virtual work, application of energy theorems for computing deflections in beams,	6 Hrs.
Unit 3	Analysis of trusses Analysis of determinate and indeterminate pin jointed trusses by energy method, effects of settlement and pre-strains	6 Hrs.
Unit 4	Fixed and Continuous beams Fixed Beams: Analysis of indeterminate beams: Propped cantilever and fixed beams - fixed end moments and reactions for standard cases of loading – slopes and deflections in fixed beams Continuous Beams: Clapeyron's theorem of three moments for continuous beams, beam with different MI, effect of sinking of supports	6 Hrs.
Unit 5	Moment Distribution Method Analysis of continuous beams propped cantilevers, continuous beams - theorem of three moments - analysis of continuous beams settlement effects, thermal effect, Shear Force and Bending Moment diagrams for continuous beams, portal frames without sway.	6 Hrs.



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Unit 6	Slope Deflection Method Nature of equilibrium methods, the slope deflection equation, interpretation of slope deflection equation, Analysis of continuous beams, fixed beams and overhanging beams by slope deflection method, effect of sinking of supports, portal frames without sway.	6 Hrs.
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Sr. No.	Textbooks
1.	Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill, 3rd edition 2010
2.	Wang C.K., "Statically Indeterminate Structures", McGraw Hill
3.	Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. I", ISBN NO: 978-81-7409-140-8
4.	Khurmi R.S., "Theory of Structures", S Chand, Delhi
5.	Punmia B.C., "Structural Analysis", Laxmi
Reference Books	
1.	Timoshenko and Young, "Theory of structures", McGraw Hill
2.	Norris C. H. and Wilbur J. B., "Elementary Structural Analysis", McGraw Hill
3.	Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH
4.	Hibbler R. C., "Structural Analysis", Pearson Publications, 9th Edition
5.	Ramamrutham S. and Narayanan R., "Theory of Structures" Dhanpat Rai Publishers, Delhi
Web Resources	
1.	NPTEL COURSE: https://onlinecourses.nptel.ac.in/noc26_ce52/preview



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Course Title: Building Planning, Construction and Materials**Course Code: CE254210****Course Category: PCC**

Teaching Scheme	Examination Scheme	
Lectures: 03 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks
Course Prerequisite: - Understanding common materials such as stone, brick, cement, sand, steel and timber. - Ability to understand simple building drawings, plans, sections and elevations. - Knowledge of length, area, volume and standard units used in construction. - Understanding of different types of buildings such as houses, apartments and bungalows. - Awareness of sunlight, wind direction, ventilation and orientation of buildings.		
Course Description: This course introduces the fundamental building materials and construction techniques used in civil engineering. It covers the properties and applications of materials such as stones, bricks, cement, concrete, timber, bituminous materials, glass and modern construction materials. The course also explains various building components, masonry work, finishing techniques, and construction practices. In addition, students learn the principles of building planning, orientation, green building concepts, and building services according to relevant codes and regulations. Overall, it provides basic knowledge required for planning and construction of buildings.		
Course Objectives: - To understand building construction, components, and formwork with safety practices. - To describe properties and use of building materials as per BIS standards. - To study principles of building planning and green building concepts. - To learn byelaws, anthropometry, and preparation of building drawings and service		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Recall building construction, materials, components, and services with safety considerations.	Remember (BL 1)
CO2	Explain building systems and environmental factors for efficient design.	Understand (BL 2)
CO3	Implement planning principles, byelaws, and material properties in building design.	Apply (BL 3)
CO4	Examine building drawings and service layouts in relation to functional and regulatory requirements.	Analyze (BL 4)

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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	-	1	3	2	1
CO2	3	2	2	1	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	2	-	-	-	-	2	2	3	3	2
CO4	3	2	3	2	2	-	-	-	-	2	2	3	3	2

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Masonry construction & Form work: Masonry- its type, materials for construction, construction procedure, types of bonds, Scaffolding requirement and types. Recent trends in lightweight masonry, Form work and its types, materials used for formwork, safety precautions in formwork and casting procedure for RCC structural members.	6 Hrs.
Unit 2	Building Components: Various components of building, their functions and their basic requirements i.e substructure and superstructure requirements. Types of foundation, plinth, plinth filling, column, beam, slab/roof, flooring, lintel, arches, weather shed, parapet wall, windows, doors, stairs etc.	6 Hrs.
Unit 3	Building Materials: Physical, chemical and engineering properties of building materials as per BIS specifications, laboratory tests to be performed. Engineering properties building materials: bricks, stones, timber, lime, cement, aggregates, mortar, concrete, glass, steel, bituminous materials, paints, thermal & sound insulating materials, and waterproofing compounds Safety aspects with respect to storage of materials, Eco-friendly building materials	7 Hrs.
Unit 4	Principles of building planning Principles of building planning, significance sun diagram, wind diagram, orientation, factors affecting and criteria under Indian conditions, concept of Green building: Concept, Principles, Materials, Characteristics, Applications	5 Hrs.
Unit 5	Building Services Building planning byelaws & regulations as per SP-7, planning of residential building: bungalows, row bungalows, apartments and twin bungalows, procedure of building permission, significance of commencement, plinth completion or occupancy certificate. Anthropometry: Study of Human dimensions, Concept of percentile in Indian standards, space required for various simple activities, Circulation spaces	6 Hrs.



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Unit 6	Architectural planning of buildings: Functional requirements and dimensions of various units. Development of plan, elevation, sectional elevation, and schedule of opening from the given line plan of residential buildings. Prepare water supply, sanitary and electrical layout for residential buildings. Planning of public buildings.	6 Hrs.
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Sr. No.	Textbooks
1.	B.C. Punmia, Building Construction, Laxmi Publications.11th Edition (2016)
2.	S. K. Duggal, Building Materials, New Age International Publishers. 5th Edition (2019)
3.	S.V. Deodhar, Building Materials, Khanna Publication
4.	S.S.Bhavikatti, Building Materials, Vikas Publication House Private Ltd. First Edition (2014)
5.	Bindra and Arora, Building Construction, Dhanpat Rai Publications.11th Edition (2010)
6.	Building Drawings with an Integrated Approach to Built Environment by M. G. Shah, C. M. Kale and S. Y. Patki, New Delhi, Tata McGraw Hill.5th Edition (2017)
Reference Books	
1.	R. Barry, The construction of buildings, seventh edition, Vol.1 & Vol.2 , Oxford: Blackwell Science.5th Edition (1999) ISBN-13
2.	Ruth T. Brantley & L. Reed Brantley, Building Materials Technology,Tata McGraw Hill. (1995).
3.	National Building Code (R 2016).
4.	Frederick Meritt, Building Design and construction by, Tata McGraw Hill.5th Edition (1994) Hand Book. 5. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings, Revision-2 (R 2017)
Web Resources	
1.	https://www.bis.gov.in/standards/technical-department/national-building-code/
2.	https://mohua.gov.in/upload/uploadfiles/files/Chap-4.pdf
3.	https://mohua.gov.in/



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Course Title: Fluid Mechanics**Course Code: CE254211****Course Category: PCC**

Teaching Scheme	Examination Scheme	
Lectures: 03 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 03	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks
Course Prerequisite: - Engineering Mechanics Fundamentals – Concepts of force, equilibrium, pressure, and energy. - Basic Physics of Fluids – Understanding of mass, density, gravity, and pressure - Basic Knowledge of Units and Measurements – SI units, dimensions, and unit conversions used in engineering problems - Basics of Calculus – Derivatives and simple integration used in engineering analysis - Basic Mathematics – Algebra, trigonometry, and use of equations and functions.		
Course Description: This course introduces the basic principles of Fluid Mechanics and Hydraulic Machines with emphasis on real-world applications. It covers fluid properties, pressure measurement, and fluid flow used in dams, water tanks, pipelines, irrigation canals, and drainage systems. The course also explains open channel flow and the working of pumps and turbines used in water supply and hydropower projects.		
Course Objectives: - To understand fluid properties and behavior under static and dynamic conditions. - To apply continuity, momentum, and energy principles in fluid flow analysis. - To analyze flow through pipes and pipe networks, including energy losses. - To study open channel flow characteristics and hydraulic phenomena such as hydraulic jump and critical flow. - To understand dimensional analysis, model similitude and performance of hydraulic machines such as turbines and pumps.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Recall basic fluid properties, hydrostatic pressure, and stability of floating bodies.	Remember (Level 1)
CO2	Explain fluid flow types using fluid dynamics and visualization methods.	Understand (Level 2)
CO3	Identify pipe and open channel flow equations to determine losses and efficient open channel sections.	Apply (Level 3)
CO4	Simplify principles of dimensional analysis, similarity laws, and model studies to analyze fluid flow problems.	Analyze (Level 4)
CO5	Interpret working, performance, and selection of hydraulic machines including turbines and pumps.	Evaluate (Level 5)



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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	-	-	-	-	-	1	3	3	2
CO2	3	2	2	2	-	2	-	-	-	-	1	2	-	-
CO3	3	3	2	2	2	-	-	-	-	-	1	-	2	-
CO4	3	2	3	3	-	2	-	-	-	-	1	3	-	3
CO5	3	2	3	3	-	2	-	-	-	-	1	3	2	-

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Fluid Statics Definition of fluids, fluid properties-density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension, capillarity, vapor pressure, types of fluids - Newtonian and non-Newtonian fluid, Forces on fluid elements, hydrostatic pressure on plane and curved surface, buoyancy & Floatation, Meta-centric height and its determination	6 Hrs.
Unit 2	Fluid Kinematics and Dynamics Types of flow, continuity equation, Continuity, momentum and energy equations and their applications, flow measuring devices, Euler's equation, Bernoulli's equation, velocity potential and stream function, concept of flow net.	6 Hrs.
Unit 3	Flow through Pipes Loss of energy in pipes, pipe discharging from a reservoir, pipe connecting two reservoirs in series and parallel, siphon, transmission of power through nozzle, water hammer in pipes- pipe networks; concept of boundary layer and its growth; Concept of lift and drag	6 Hrs.
Unit 4	Open Channel Flow Introduction, difference between pipe flow and open channel flow, types of open channels, types of flows in open channel, geometric elements, velocity distribution, measurement of velocity (Pitot tube, current meter) weir & spillway: sharp, broad & round crested weirs, calibration of weir, profile of ogee spillway, flow below gates, Channel Hydraulics –Energy-depth relationships, specific energy, slope profile, critical flow, hydraulic jump, uniform flow, and gradually varied flow.	6 Hrs.



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Unit 5	Dimensional Analysis and Hydraulic Similitude Nature of dimensional analysis, Rayleigh's Method, Buckingham pi theorem, dimensionless groups and their physical significance, flow similarity and model studies, Scale Effects, Distorted and Undistorted Models	6 Hrs.
Unit 6	Hydraulic Machines Basics of hydraulic machines, Turbines: Importance of hydropower, classification of turbines, description, typical dimensions and working principle of Pelton, Francis & Kaplan turbine (detailed design need not to be dealt with), Pumps: Classification, component parts, working of centrifugal pump, performance characteristics, pump selection	6 Hrs.

Sr. No.	Textbooks
1.	Bansal R. K., 1989, "Fluid Mechanics", Laxmi Publications, Delhi
2.	Modi and Seth, 2017, "Fluid Mechanics and Hydraulic Machinery", Standard Book House, Tenth Edition, 1991
3.	Jain A.K, 1998, "Fluid Mechanics including Hydraulic Machines" ISBN: 978-81-7409-194-7
Reference Books	
1.	Streeter V. L., Bedford K. W. and Wylie E. B., 1998, "Fluid Dynamics", New York, McGraw- Hill, Ninth Edition
2.	Som S. K. & Biswas G., 2017, "Introduction to Fluid Mechanics & Fluid Machines", Tata McGraw-Hill.
3.	Kumar K. L., 2010, "Fluid Mechanics", S. Chand publication
4.	Fox, R. W. and McDonald, A. T., 2011, "Introduction to Fluid Mechanics", John Wiley and Sons, Fifth Edition
Web Resources	
1.	Fluid statics, kinematics and dynamics with Applications, NPTEL, http://digimat.in/nptel/courses/video/105101082/L15.html
2.	Flow through pipe, NPTEL, https://www.youtube.com/watch?v=TkDAV_R_zFU
3.	Open channel flow, NPTEL, https://www.youtube.com/watch?v=XWwdzmQypM
4.	Hydraulic Machines, NPTEL, https://onlinecourses.nptel.ac.in/noc23_me98/preview



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Course Title: Modern Indian Language II Course Code: GE254705		Course Category: HSSM- AEC	
Teaching Scheme		Examination Scheme	
व्याख्याने (Lectures): ०२ तास/आठवडा (02 hrs / week)		CA-1	10 Marks
ट्यूटोरियल (Tutorial): -		CA-2	10 Marks
श्रेयांक (Credits): 02		MSE	20 Marks
सत्र (Semester): द्वितीय वर्ष (सत्र ४) (Second Year (Semester IV))		ESE	60 Marks
Course Prerequisite: देवनागरी लिपी वाचण्याचे आणि लिहिण्याचे प्राथमिक ज्ञान			
Course Description: हा अभ्यासक्रम सर्व शाखांच्या अभियंत्यांना मराठी भाषेचे व्यावहारिक आणि उद्योगभिमुख ज्ञान प्रदान करण्यासाठी तयार करण्यात आला आहे. यामध्ये विद्यार्थी मराठी भाषेचा इतिहास आणि व्याकरणाचा भक्कम पाया रचतील आणि त्यानंतर आकलन कौशल्ये व शब्दसंपत्ती वाढवण्यावर लक्ष केंद्रित करतील. हा अभ्यासक्रम प्रामुख्याने व्यावसायिक उपयोजनावर भर देतो, ज्यामध्ये अधिकृत पत्रव्यवहार, इतिवृत्त लेखन आणि अचूक पारिभाषिक व प्रशासकीय संज्ञांचा वापर शिकवला जाईल. याव्यतिरिक्त, तांत्रिक संकल्पनांचे अचूक संप्रेषण सुनिश्चित करण्यासाठी विद्यार्थी इंग्रजी आणि मराठी या दोन्ही भाषांमधील भाषांतर कौशल्ये विकसित करतील. सरतेशेवटी, हा अभ्यासक्रम भावी अभियंत्यांना स्थानिक उद्योग, कॉर्पोरेट क्षेत्र आणि शासकीय कार्यालयांमध्ये आत्मविश्वासाने आणि प्रभावीपणे संवाद साधण्यास सक्षम बनवतो.			
Course Objectives: - विद्यार्थ्यांना मराठी भाषेचा उगम, विकास, देवनागरी लिपी आणि विविध साहित्य प्रकारांची ओळख करून देणे. - विद्यार्थ्यांना मराठी व्याकरणाचे मूलभूत नियम, शुद्धलेखन आणि अचूक वाक्यरचना यांचे सखोल ज्ञान देणे. - विद्यार्थ्यांची शब्दसंपत्ती वाढवणे आणि दैनंदिन तसेच व्यावसायिक संवादात वाक्प्रचार व म्हणींचा योग्य वापर करण्यास शिकवणे. - विद्यार्थ्यांमध्ये तांत्रिक आणि प्रशासकीय उताऱ्यांचे वाचन, विश्लेषण आणि अचूक आकलन करण्याची क्षमता विकसित करणे. - विद्यार्थ्यांना कार्यालयीन कामकाज, पत्रव्यवहार आणि अभियांत्रिकी क्षेत्रात वापरल्या जाणाऱ्या पारिभाषिक संज्ञांचे व्यावहारिक प्रशिक्षण देणे. - विद्यार्थ्यांना भाषांतराची तत्वे आणि पद्धती समजावून सांगणे आणि इंग्रजी-मराठी भाषांतराचा (विशेषतः तांत्रिक संदर्भात) सराव करून घेणे.			

Course Outcomes:		
COs	अभ्यासक्रम पूर्ण झाल्यानंतर विद्यार्थी सक्षम असतील (After completion of the course: Students will be able to)	Bloom's Level
CO1	मराठीचा इतिहास आणि विकास, मराठी व्याकरण, शब्दसंपत्ती आणि भाषासमृद्धी, आकलन कौशल्ये, व्यावहारिक आणि उपयोजित मराठी आणि भाषांतर कौशल्ये यांच्याशी संबंधित मूलभूत तथ्ये, माहिती, नियम आणि मानकांचे स्मरण करणे.	स्मरण Remember (Level 1)
CO2	मराठीचा इतिहास आणि विकास, मराठी व्याकरण, शब्दसंपत्ती आणि भाषासमृद्धी, आकलन कौशल्ये, व्यावहारिक आणि उपयोजित मराठी आणि भाषांतर कौशल्ये यांच्याशी संबंधित विविध संकल्पना, रचना, आशय आणि कार्यपद्धती स्पष्ट करणे.	समज Understand (Level 2)



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CO3	मराठीचा इतिहास आणि विकास, मराठी व्याकरण, शब्दसंपत्ती आणि भाषासमृद्धी, आकलन कौशल्ये, व्यावहारिक आणि उपयोजित मराठी आणि भाषांतर कौशल्ये यांमधील शिकलेल्या नियमांचे, तत्वांचे आणि कौशल्यांचे प्रत्यक्ष कामकाजात उपयोजन करणे.	उपयोजन Apply (Level 3)
CO4	मराठीचा इतिहास आणि विकास, मराठी व्याकरण, शब्दसंपत्ती आणि भाषासमृद्धी, आकलन कौशल्ये, व्यावहारिक आणि उपयोजित मराठी आणि भाषांतर कौशल्ये यांच्याशी संबंधित विविध भाषिक घटक, रचना, साहित्याचा आशय आणि माहितीचे पृथक्करण व विश्लेषण करणे.	विश्लेषण Analyze (Level 4)

CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1									2					
CO2									2					
CO3									3		1			
CO4									3		1			

Assessment	
CA-1 (a)	वर्णनात्मक चाचणी / गृहपाठ / बहुपर्यायी प्रश्न चाचणी इत्यादी. (Subjective Test / Assignment / MCQ Test etc.)
CA-2 (b)	वर्णनात्मक चाचणी / गृहपाठ / बहुपर्यायी प्रश्न चाचणी इत्यादी. (Subjective Test / Assignment / MCQ Test etc.)
MSE (c)	वर्णनात्मक चाचणी (Subjective Test)
ESE (d)	अंतिम सत्र परीक्षा (End Semester Exam)

Course Contents		
Unit 1	मराठीचा इतिहास आणि विकास (History and Literature of Marathi) मराठी भाषेचा उगम (Origin of Marathi Language), मराठी भाषेचा विकास (Development of Marathi Language), विविध मराठी साहित्य प्रकारांचा परिचय (Introduction to Various Marathi Literary Forms), प्रसिद्ध मराठी साहित्यिक (Famous Marathi Authors), निवडक साहित्यकृतींचा परिचय (Introduction to Selected Literary Works).	4 Hrs.
Unit 2	मराठी व्याकरण (Marathi Grammar) मराठी वर्णमाला (Marathi Alphabet), शब्दांच्या जाती (Parts of Speech), काळांचे प्रकार (Types of Tenses), अचूक वाक्यरचना (Correct Sentence Formation), शुद्धलेखनाचे नियम (Rules of Orthography/Spelling), विरामचिन्हांचा योग्य वापर (Proper Use of Punctuation).	4 Hrs.
Unit 3	शब्दसंपत्ती आणि भाषासमृद्धी (Vocabulary Building) समानार्थी शब्द (Synonyms), विरुद्धार्थी शब्द (Antonyms), शब्दांची उत्पत्ती: तत्सम, तद्भव, देशी शब्द (Word Origin), शुद्ध आणि अशुद्ध शब्दांची ओळख व दुरुस्ती (Identifying and Correcting Spelling Errors), दैनंदिन संवादात म्हणींचा वापर (Use of Proverbs in Daily Communication), वाक्प्रचारांचा वापर (Use of Idioms).	4 Hrs.
Unit 4	आकलन कौशल्ये (Reading & Comprehension)	4 Hrs.



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	दिलेल्या उताऱ्याचे वाचन, विश्लेषण आणि त्यावरील प्रश्नांची अचूक उत्तरे लिहिणे (Reading, Analysis, and Answering Questions on a Given Passage), तांत्रिक किंवा प्रशासकीय उताऱ्यांचे वाचन आणि सारांश लेखन (Reading technical or administrative passages in Marathi and summarizing them).	
Unit 5	व्यावहारिक आणि उपयोजित मराठी (Practical & Applied Marathi) औपचारिक पत्रे (Formal Letters), इतिवृत्त लेखन (Meeting Minutes Writing), पारिभाषिक संज्ञा (Technical Terminology), अभियांत्रिकी कामात वापरले जाणारे इंग्रजी-मराठी शब्द (English-Marathi Words Used in Engineering Work), प्रशासकीय कामात वापरले जाणारे इंग्रजी-मराठी शब्द (English-Marathi Words Used in Administrative Work).	4 Hrs.
Unit 6	भाषांतर कौशल्ये (Translation Skills) भाषांतराची तत्वे (Principles of Translation), भाषांतराच्या पद्धती (Methods of Translation), शब्दशः भाषांतर (Literal Translation), आशयनिष्ठ भाषांतर (Contextual/Sense Translation), मराठीतून इंग्रजीत भाषांतर (Marathi to English Translation), इंग्रजीतून मराठीत भाषांतर (English to Marathi Translation).	4 Hrs.

Sr. No.	Textbooks
1.	मो. रा. वाळिंबे, सुगम मराठी व्याकरण व लेखन, नितीन प्रकाशन.
2.	डॉ. ल. रा. नसिराबादकर, व्यावहारिक मराठी, फडके प्रकाशन.
	Reference Books
1.	यास्मिन शेख, मराठी लेखन मार्गदर्शिका, पद्मगंधा प्रकाशन.
2.	डॉ. स्नेहल तावरे, व्यावहारिक मराठी, स्नेहवर्धन प्रकाशन.
3.	भाषा संचालनालय, शासन व्यवहार कोश, महाराष्ट्र शासन.
4.	डॉ. कल्याण काळे, डॉ. अंजली सोमण, भाषांतर मीमांसा, प्रतिमा प्रकाशन
5.	अ. ना. देशपांडे, मराठी साहित्याचा इतिहास (खंड १ आणि २), वहीनस प्रकाशन.
6.	शब्दकोश आणि शास्त्रीय व तांत्रिक परिभाषा कोश, महाराष्ट्र राज्य साहित्य आणि संस्कृती मंडळ.
7.	कृ. पां. कुलकर्णी, मराठी भाषा: उद्गम व विकास, मेहता पब्लिशिंग हाऊस.
	Web Resources
1.	महाराष्ट्र शासन, भाषा संचालनालय (Directorate of Languages, Govt. of Maharashtra): https://languages.maharashtra.gov.in
2.	राज्य मराठी विकास संस्था (RMVS): https://rmvs.maharashtra.gov.in
3.	मराठी विश्वकोश (Marathi Vishwakosh): https://marathivishwakosh.org
4.	भारत वाणी (Bharatavani Portal): https://bharatavani.in
5.	महाराष्ट्र राज्य साहित्य आणि संस्कृती मंडळ: https://sahitya.marathi.gov.in



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Course Title: Entrepreneurship Development		
Course Code: CE254706		Course Category: HSSM-EEMC
Teaching Scheme	Examination Scheme	
Lectures: 02 hrs/ week	CA-1	10 Marks
Tutorial: -	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks
Course Prerequisite: Basic knowledge of economics, management principles, and interest in entrepreneurship and innovation will be beneficial.		
Course Description: This course introduces the fundamentals of entrepreneurship, startup ecosystems, and innovation-driven business development. It covers idea generation, business model design, startup funding, financial planning, and government support initiatives for entrepreneurs. Learners will explore practical tools such as Business Model Canvas, value proposition design, and strategies for launching and scaling ventures. The course aims to develop entrepreneurial mindset, problem-solving ability, and business planning skills for creating sustainable enterprises.		
Course Objectives: 1. To develop understanding of the entrepreneurial mindset, attitudes, and core competencies required for entrepreneurship. 2. To introduce the fundamentals of business planning, startup creation, and venture management. 3. To equip with knowledge of funding opportunities, financial planning, and investment strategies for startups. 4. To provide insights into market research, product development, customer needs, and business growth strategies. 5. To build awareness of government policies, incubation support systems, startup ecosystems, and emerging industry trends.		

Course Outcomes:		
COs	After completion of the course student will be able to	Bloom's Level
CO1	Demonstrate and explain fundamental concepts related to entrepreneurship and business practices.	Remember (Level 1)
CO2	Implement systematic methods for identifying opportunities and making informed decisions.	Understand (Level 2)
CO3	Utilize appropriate techniques for planning, organizing, and managing activities in an entrepreneurial context.	Apply (Level 3)
CO4	Examine various factors influencing performance, growth, and sustainability in business environments.	(Analyze) (Level 4)



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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	1	-	-	2	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	2	-	-	-
CO3	1	2	3	1	1	-	-	1	2	2	3	-	-	-
CO4	2	3	2	2	1	2	3	2	1	1	2	-	-	-

Assessment	
CA-1 (a)	Entrepreneurial Ideation / Business Idea Exploration/MCQ Test etc.
CA-2 (b)	Case Study/ Business Plan Assignment / Startup Pitch Presentation / etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Examination

Course Contents		
Unit 1	Introduction To Entrepreneurship Concept And Importance of Entrepreneurship, Competencies of Successful Entrepreneurs, Types of Entrepreneurs, Role of Entrepreneurship in Economic Development, Entrepreneurial Mindset and Motivation Theories, Barriers to Entrepreneurship.	4 Hours
Unit 2	Business Idea Generation and Market Research Advanced Techniques for Idea Generation and Opportunity Recognition, Opportunity Screening and Feasibility Analysis (Technical, Financial, Market), Market Research Methods, Consumer Behavior Analysis, Competitor Analysis.	4 Hours
Unit 3	Business Plan Development Business Model Canvas (BMC): Value Proposition; Channels; Revenue Streams; Structure and Components of a Business Plan, Financial Planning Including Costing, Pricing, Budgeting and Break-Even Analysis, Risk Assessment and Mitigation Strategies.	4 Hours
Unit 4	Funding And Financial Management Sources of Startup Funding: Bootstrapping; Angel Investors; Venture Capital; Crowd funding; Institutional Finance, Stages of Funding, Financial Statements, Valuation Basics, Overview of Government Initiatives and Schemes.	4 Hours
Unit 5	Business Operations and Legal Aspects Forms of Business Organization, Business Registration Procedures and Regulatory Compliance, Intellectual Property Rights, Contract Management Basics, Startup Taxation Basics, Ethical Issues in Entrepreneurship, Corporate Social Responsibility (CSR) and Sustainability.	4 Hours



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Unit 6	Growth Strategies and Case Studies Startup Growth and Scaling Strategies, Branding and Positioning, Digital Marketing Strategies, Technology-Driven Entrepreneurship, Startup Ecosystem, Startup Pitching, Case Studies of Successful and Failed Startups.	4 Hours
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Textbooks	
1.	Vasant Desai, "Entrepreneurial Development", Himalaya Publishing House, Mumbai.
2	S.S. Khanka, "Entrepreneurial Development", S. Chand Publishing, New Delhi.
3	Robert D. Hisrich, "Entrepreneurship", McGraw-Hill Education.
4	Rajeev Roy, "Entrepreneurship", Oxford University Press, New Delhi.
Reference Books	
1	Peter F. Drucker, "Innovation and Entrepreneurship", Harper Business Publications.
2	Eric Ries, "The Lean Startup", Crown Business Publications.
3	Steve Blank and Bob Dorf, "The Startup Owner's Manual", K&S Ranch Press.
4	Alexander Osterwalder and Yves Pigneur, "Business Model Generation", Wiley Publications.
5	Aswath Damodaran, "Applied Corporate Finance", Wiley India.
Web Resources	
1	NITI Aayog – Startups: Policies, innovation strategies, and initiatives supporting entrepreneurship and startup growth (https://www.niti.gov.in/verticals/industry/startups)
2	Strategyzer – Business Model Canvas: (https://www.strategyzer.com/canvas/business-model-canvas)
3	Investopedia – Venture Capital: Covers startup funding sources such as venture capital, angel investment, valuation (https://www.investopedia.com/terms/v/venturecapital.asp)
4	Harvard Business Review – Entrepreneurship: Articles and insights on innovation, startup strategy, leadership, and business growth (https://hbr.org/topic/entrepreneurship)
5	Startup India – Government of India Startup Portal: Information on startup registration, schemes, entrepreneurship ecosystem support (https://www.startupindia.gov.in/)
6	MSME Ministry, Government of India: Resources for small business development, MSME schemes, entrepreneurship support, and policy initiatives (https://msme.gov.in/)



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Course Title: Environmental and Sustainable Engineering**Course Code: CE254707****Course Category: HSSM-VEC**

Teaching Scheme	Examination Scheme	
Lectures: 02hrs./ week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits:02	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks
Course Prerequisite: - Understanding water resources, water quality parameters, and environmental protection concepts. - Concepts such as flow, velocity, pressure, and pipe flow used in water supply and sewer design. - Ability to perform calculations related to flow rate, population forecasting, and treatment unit design used in water and wastewater systems.		
Course Description: The course covers the basics of water supply engineering, including planning of water supply schemes, demand estimation, and population forecasting in India. It explains the principles and design of water treatment processes such as aeration, sedimentation, coagulation, filtration, and disinfection. The syllabus also includes sanitation infrastructure and wastewater management, covering sewer design and stream purification using the Streeter–Phelps equation. It further studies wastewater treatment methods like the Activated Sludge Process and advanced treatment concepts such as Zero Liquid Discharge. This course also involves concepts of sustainable development, Local Environmental Issues, Global Environmental Issues, Sustainable Industrialization and Urbanization		
Course Objectives: - To understand the planning and design of water supply systems and water demand estimation in India. - To learn the principles and design of water treatment processes used in water treatment plants. - To study sanitation infrastructure and wastewater collection systems.		

Course Outcomes:

COs	After completion of the course students will be able to	Bloom's Level
CO1	Memorize the fundamentals of environmental engineering and components of water supply systems	Remember (Level 1)
CO2	Identify the drinking water treatment processes and water distribution systems.	Understand (Level 2)
CO3	Describe sanitation engineering and components of sewerage systems.	Understand (Level 2)
CO4	Use wastewater and sludge treatment methods in sewage treatment systems.	Apply (Level 3)
CO5	Analyze drinking water and wastewater quality parameters.	Analyze (Level 4)
CO6	Illustrate sustainable development and its environmental engineering aspects.	Analyze (Level 4)

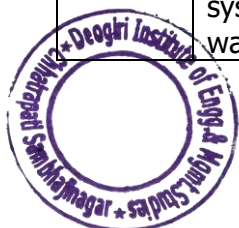
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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	2	2	3	2	2
CO2	3	3	3	2	2	2	-	-	-	1	1	3	3	3
CO3	3	3	2	1	1	-	-	-	-	-	1	3	1	2
CO4	3	2	3	2	2	2	-	-	-	1	2	3	3	2
CO5	3	3	2	2	-	2	-	-	-	-	2	3	1	1
CO6	3	3	2	2	1	2	-	-	-	2	2	3	2	2

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Basics of Environmental Engineering Environment and its components, Role of Environment Engineer, Introduction of water supply scheme, Water supply system components and layout, Design period, Population forecasting, Water demand, Storage capacity of reservoir, Intake structure, Jack well.	4 Hrs.
Unit 2	Water Quality and Drinking Water Treatment Physical, chemical, and biological water quality parameters, IS 10500-2012, Necessity of the water treatment process, Layout and general outline of Water treatment units, Primary, secondary, tertiary treatment units, Screening. Aeration, Sedimentation, water softening, coagulation, flocculation, filtration, Disinfection. Advanced treatment technique, Membrane technology.	4 Hrs.
Unit 3	Water Distribution System Continuous and intermittent system, layout of distribution, Gravity, Pumping, and Combination, Pressure pipe, types, testing of pipe, valves, joints, design of rising main, appurtenance, in distribution system, Component of ESR, Plumbing Fixtures.	4 Hrs.
Unit 4	Sanitation Infrastructure System Sanitary Engineering, Wastewater Sources and types, House drainage system, Traps, Collection and conveyance, Water carriage system, Separate sewerage, combined sewerage system, Wastewater flow rate, types of sewers, Hydraulic design of sewer, Self cleansing velocity, sewer, types, sewer appurtenance, storm regulator, design of circular sanitary sewer.	4 Hrs.
Unit 5	Wastewater characteristics and Wastewater Treatment Wastewater characteristics, types of sewage, BOD, SVI, Oxygen sag curve, DO model, Unit operation and process, Preliminary, primary, secondary, tertiary Treatment, Screening, Oil grease removal, grit chamber, Aerator, Sedimentation, Coagulation, filtration, Sedimentation, Equalization, Neutralization. Zero liquid discharge technology, biological filtration, Trickling filter, Activated sludge process, Phytoremediation, Operational problem and control measures, Sludge management system, septic tank, fecal sludge management, Disposal of sewage, Reuse of treated wastewater.	4 Hrs.



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Unit 6	Introduction to sustainable engineering Sustainable development, concepts of sustainable development: three pillar model, principles of sustainable development, sustainable engineering, threats for sustainability, Environmental Ethics and Legislations, Local Environmental Issues, Global Environmental Issues, Sustainable Industrialization and Urbanization, Renewable energy resources, Green technology and Green Business.	4 Hrs.
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Sr. No.	Textbooks
1.	S. K. Garg, Water Supply Engineering, Khanna Publishers, New Delhi, 35th Edition (2015).
2.	G. S. Birdie and J. S. Birdie Water Supply and Sanitary Engineering, Dhanpat Rai Publishing Company, New Delhi, 9th Edition, (2010).
3.	B. C. Punmia, Ashok Jain and Arun Jain, Environmental Engineering-1: Water Supply Engineering, Laxmi Publications (P) Ltd, 2nd Edition, Reprint (2016).
4.	S. K. Garg, Sewage Disposal & Air Pollution Engineering, Khanna Publication, 41st Edition, (2018).
5.	Bhavik R. Bakshi, Sustainable Engineering: Principles and practice, Cambridge University Press
	Reference Books
1.	Peavy and Rowe, Environmental Engineering, McGraw Hill Publications, (2017).
2.	Metcalf & Eddy, Waste Water Treatment & Disposal, McGraw Hill Education (India) Private Limited, 4th Edition, (2017).
3.	Manual on Sewerage & Sewage Treatment published by Ministry of Urban Development, New Delhi, Third Edition, (1993).
4.	Arceivala and Asolekar, Wastewater Treatment for Pollution Control and Reuse, McGraw Hill Education (India) Private Limited, 3rd Edition, (2017).
5.	Mary Franson, Standard Methods for examination of water and wastewater, American Public Health Association IS Codes 01
6.	Catherine N. Mulligan, Sustainable Engineering: Principles and implementation, CRC press
7.	Kailas L. Wasewar and Sunita Neti Rao, Sustainable Engineering, Energy & the Environmental, CRC Press.
	Web Resources
1.	http://cpheeo.gov.in/cms/manual-on-water-supply-and-treatment.php
2.	http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php
3.	http://cpheeo.gov.in/cms/manual-on-storm-water-drainage-systems---2019.php
4.	http://cpheeo.gov.in/cms/manual-on-operation--and-maintenance-of-water-supply-system-2005.php



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Civil Engineering

Course Title: Environmental Engineering and Fluid Mechanics Lab**Course Code: CE254212****Course Category: PCC**

Teaching Scheme	Examination Scheme	
Practical: 02 hrs. / week	CA-1	15 Marks
Credits: 01	CA-2	15 Marks
Semester: Second Year (Semester IV)	ESE	20 Marks

Course Prerequisite:

- Basic chemistry knowledge
- Fundamentals of Environmental Engineering
- Basic of Fluid Mechanics – Properties of fluid, Pressure, rate of flow, static and dynamic pressure, Bernoulli's theorem, and flow measurement
- Engineering Physics – Basic concepts of pressure, density, viscosity, and forces
- Basic Engineering Mathematics – Understanding of algebra, calculus, and basic numerical calculations used in fluid flow analysis.

Course Description:

This course provides practical knowledge of water and wastewater analysis. Students perform experiments to determine physical, chemical and biological characteristics of water such as pH, turbidity, alkalinity, hardness, chlorides, dissolved oxygen and BOD/COD.

This laboratory course provides practical exposure to fundamental concepts of fluid mechanics and hydraulics. Students perform experiments to measure fluid pressure, verify basic fluid flow principles, calibrate flow measuring devices, analyze head losses and hydraulic jump, and study the performance characteristics of hydraulic turbines and centrifugal pumps. The course helps students understand fluid behavior and hydraulic machine performance through hands-on experimentation

Course Objectives:

1. To provide practical knowledge of laboratory techniques used in the analysis of water and wastewater quality parameters.
2. To familiarize students with the operation and handling of common environmental laboratory instruments and equipment.
3. To develop the ability to perform standard tests such as pH, turbidity, alkalinity, hardness, dissolved oxygen (DO), and biochemical oxygen demand (BOD).
4. To measure fluid pressure using different pressure measuring devices.
5. Verify fluid mechanics principles experimentally and calibrate flow measuring devices for discharge measurement.
6. To study head losses and hydraulic jump in pipe and open channel flow.
7. To evaluate performance of turbines and centrifugal pumps.

Note: - The Course Outcomes (COs) and the corresponding CO-PO mapping for this laboratory course are aligned with and detailed in the respective Theory Course Syllabus.

Assessment	
CA-1 (a)	Practical Performance
CA-2 (b)	Practical Performance
ESE (c)	Practical & Oral Examination



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Sr. No.	List of Experiments
1.	To assess the acidity/basicity (pH) of a water sample by using digital pH meter for evaluating its chemical stability
2.	To determine the concentration of calcium and magnesium ions (Hardness) in water by standard EDTA method for assessing its suitability for domestic and industrial use.
3.	To estimate the chloride ion (Chloride) concentration in water by Mohr's method as an indicator of salinity and possible contamination
4.	To evaluate the Total solids (TS), Total dissolved solids (TDS), and Total suspended solids (TSS) present in water for assessing its quality and purity.
5.	To measure the settling characteristics of sludge (SVI) for evaluating the efficiency of the wastewater treatment process.
6.	To determine the amount of oxygen dissolved (DO) in water for assessing its ability to support aquatic life.
7.	To assess the amount of oxygen required (BOD) by microorganisms to decompose organic matter in water for evaluating the level of biodegradable pollution
8.	To develop a Microsoft Excel program for simulating and analyzing fluid pressure based on user-input parameters.
9.	To simulate pipe flow using OpenFOAM for demonstrating Bernoulli's theorem
10.	To simulate loss of head through a pipe using waterGEMS for visualizing major and minor losses.
11.	To simulate hydraulic jump using OpenFOAM for analyzing energy dissipation and flow transition in open channels.
12.	To simulate notch and weir flow using OpenFOAM for discharge calibration.
13.	To simulate hydraulic turbines using Microsoft Excel program for analyzing efficiency, discharge, and power output under varying conditions.
14.	To simulate centrifugal pump performance using OpenFOAM for analyzing key parameters.

Sr. No.	Textbooks
1.	S. K. Garg, Water Supply Engineering, Khanna Publishers, New Delhi, 35th Edition (2015).
2.	Dr. Akram Salim Pathan, Dr. G. R. Gandhe, Dr. S. D. Shinde, Hydraulics Laboratory Manual, Practical Book with Viva Voce,
3.	John Schuring, Ashish Borgaonkar, Brian Shiels, Hydraulics Laboratory Manual: Experiments with Applications,
4.	Robabeh Jazaei, Fluid Mechanics Experiments
Reference Books	
1.	Peavy and Rowe, Environmental Engineering, McGraw Hill Publications, (2017).
2.	Bansal R. K., 1989, "Fluid Mechanics", Laxmi Publications, Delhi
3.	Modi and Seth, 2017, "Fluid Mechanics and Hydraulic Machinery", Standard Book House, Tenth Edition, 1991
4.	Jain A.K, 1998, "Fluid Mechanics including Hydraulic Machines" ISBN: 978-81-7409-194-7
5.	Streeter V. L., Bedford K. W. and Wylie E. B., 1998, "Fluid Dynamics", New York, McGrawHill, Ninth Edition
Web Resources	
1.	Hydraulics Laboratory Manual, https://notionpress.com/read/hydraulics-laboratory-manual
2.	Virtual Labs, NITK, https://fmc-nitk.vlabs.ac.in/
3.	Virtual Labs, IITB, https://iitb.vlabs.co.in/beta_labs.html
4.	Fluid Mechanics Laboratory Manual, https://url-shortener.me/GOWA



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Course Title: Professional Development IV**Course Code: CE254604****Course Category: SC-SEC**

Teaching Scheme	Examination Scheme	
Practical: 02 hrs. / week	CA-1	15 Marks
Credits: 01	CA-2	15 Marks
Semester: Second Year (Semester IV)	ESE	20 Marks
Course Prerequisite: - Basic Computer Literacy and Mathematical Knowledge. - Basic knowledge of Geometry, Coordinate Geometry and planning concepts. - Basic knowledge of building drawings, orientation and components.		
Course Description: This course provides comprehensive study of computer-aided drafting (AutoCAD) software, drawings. This course is designed to equip students with the skills to prepare 2D technical drawings as per industry-standards.		
Course Objectives: - To equip learners with understanding and applying drafting concepts and standards. - To enhance productivity, improve drafting ability, and foster collaboration through hands-on training. - To set up, manage, organize and link reference external files and data set in drawings. - To manage annotations and detailing to drawing by using collaboration tools to configure and manage design output.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Comprehend the AutoCAD environment, file handling, and basic drawing tools.	Understand (Level 2)
CO2	Utilize drawing and modification commands to make 2D engineering geometries using standard drafting practices.	Apply (Level 3)
CO3	Configure drawing layouts, set proper scales, and generate professional-quality prints or PDF outputs of technical drawings.	Apply (Level 3)
CO4	Develop complete working drawings with proper layouts, parametric constraints, and detailing as per industry standards	Analyze (Level 4)

CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	–	–	2	–	–	–	1	–	1	2	–	–
CO2	2	2	2	–	3	–	–	–	1	–	1	2	2	1
CO3	1	1	2	–	2	–	–	–	3	1	1	1	2	1
CO4	2	2	3	1	3	1	–	1	2	1	2	3	3	2



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Assessment	
CA-1 (a)	Performance & Evaluation of activities Technical MCQ based test on Shortcuts / Assignment etc.
CA-2 (b)	Drawing problems and CAD exercises etc.
ESE (c)	Submission with Viva of working drawing.

Sr. No.	List of Activities
1	To study software and configure workspace, units, and templates settings.
2	To perform CAD file management and formats conversions.
3	To apply basic selection methods and coordinate input techniques.
4	To study and create basic entities and modifying as per standards.
5	To create fundamental geometry's using navigation and operational tools.
6	To apply object properties and implement layer management techniques.
7	To apply modification, annotation tools and perform editing operations.
8	To prepare partial components of buildings for spatial understanding and interaction.
9	To manage drawing organization and implement advanced modification tools.
10	To apply constraints in modeling to enhance drawing presentation and visualization.
11	To utilize parametric constraints and tools with Excel linking.
12	To prepare engineering drawings using CAD for construction documentation.

Sr. No.	Textbooks
1	N.D. Bhatt, "Engineering Drawing", Charotar Publication
2	Shah, Kale, Pataki, "Building Drawing", Tata McGraw- Hill
3	Alf Yarwood, "Introduction to AutoCAD 2010", Newnes Publication
Reference Books	
1	Nighat Yasmin, "Introduction to AutoCAD 2026 for Civil Engineering Applications", SDC Publications
2	Bethunc, J., "Engineering Graphics with AutoCAD 2017", Pearson Education
3	Geprge Omura, 'Introducing AutoCAD 2010 and AutoCAD LT 2010', Willey India Pvt. Ltd
Website	
1	https://www.autodesk.com/training
2	https://sourcecad.com/courses/autocad-essentials-course/
3	https://www.eduonix.com/autocad-2021-comprehensive-training



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Course Title: Do It Yourself IV**Course Code: CE254807****Course Category: ELC**

Teaching Scheme	Examination Scheme	
Practical: 02 hrs. / week	CA-1	15 Marks
Credits: 01	CA-2	15 Marks
Semester: Second Year (Semester IV)	ESE	20 Marks
Course Prerequisite: Basic knowledge of concrete materials. (cement, aggregates, water) Fundamentals of strength of materials. Basic understanding of construction practices.		
Course Description: This course combines Concrete Technology laboratory practices with activity-based Non-Destructive Testing (NDT). Students develop hands-on skills in material testing, mix design, casting, strength evaluation, and field-based NDT techniques like Rebound Hammer and UPV.		
Course Objectives: 1. To introduce the basic ingredients of concrete and their physical properties. 2. To develop understanding of standard tests on cement and aggregates. 3. To develop skills in preparation of concrete mix and specimen casting. 4. To introduce Non-Destructive Testing (NDT) methods for evaluation of concrete quality.		

Course Outcomes:

COs	After completion of the course students will be able to	Bloom's Level
CO1	Define the properties and characteristics of concrete ingredients such as cement, fine aggregates, coarse aggregates and water.	Remember (Level 1)
CO2	Describe the procedures and significance of standard laboratory tests conducted on cement and aggregates.	Understand (Level 2)
CO3	Perform preparation of concrete mix including mixing, casting, compaction, curing and testing of cube specimens.	Apply (Level 3)
CO4	Analyze results obtained from Non-Destructive Tests such as Rebound Hammer and Ultrasonic Pulse Velocity to evaluate concrete quality.	Analyze (Level 4)

CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	-	-	1	-	-	-	-	-	-	3	-	-
CO2	3	2	-	1	2	-	-	-	-	-	-	3	1	-
CO3	3	2	2	2	2	-	-	2	1	-	-	3	2	2
CO4	3	3	2	3	2	1	-	-	2	-	1	3	2	3



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Assessment	
CA-1 (a)	Practical Performance and Evaluation
CA-2 (b)	Practical Performance and Evaluation
ESE (c)	Practical & Oral Examination

List of Activities	
1	Identification and study of concrete ingredients such as cement, fine aggregates, coarse aggregates, and water.
2	Study of types, grades, and physical properties of cement.
3	Determination of fineness of cement using IS sieve and interpretation of results.
4	Determination of specific gravity of fine and coarse aggregates using standard methods.
5	Determination of standard consistency and setting time of cement using Vicat apparatus.
6	Preparation of concrete mix (M20), including mixing, casting, compaction, curing and testing of cube specimens.
7	Introduction to Non-Destructive Testing (NDT), its importance, applications, and relevant IS codes.
8	Study and demonstration of Rebound Hammer, including working principle and calibration.
9	Conducting Rebound Hammer test and interpretation of rebound numbers.
10	Study of Ultrasonic Pulse Velocity (UPV) test and methods of wave transmission.
11	Conducting UPV test and evaluation of concrete quality based on pulse velocity.
12	Analysis of NDT results and preparation of professional test report.

Sr. No.	Textbooks
1.	M. S. Shetty, Concrete Technology.
2.	M. L. Gambhir, Concrete Technology.
3.	Ravi Prakash, Non-Destructive Testing Techniques.
Reference Books	
1.	A. M. Neville, Properties of Concrete.
2.	A. R. Santhakumar, Concrete Technology.
3.	B. Singh Jaget, NDT of Concrete Structures.
Web Resources	
1.	NPTEL – Concrete Technology.
2.	NPTEL – NDT & Concrete Engineering.
3.	IIT Virtual Labs – Concrete Mix Design.



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Course Title: PBL IV: Problem to Project Based Learning**Course Code: CE254808****Course Category: ELC**

Teaching Scheme	Examination Scheme (As Applicable)	
Practicals/Sessions: 02 Hours/Week	CA-I	15 Marks
Credits: 01	CA-II	15 Marks
Semester: Second Year (Semester IV)	ESE	21 Marks

Course Prerequisite: Use of analytical skills and drawing tools, Design Thinking Module, Course Level- Problem Based Learning.

Course Description: This course extends problem-based learning into project realization, where students convert identified problems into working engineering solutions. It emphasizes design, development, and validation of mini-project prototypes using domain knowledge. Students apply systematic engineering approaches to build functional systems within constraints. The course promotes innovation, teamwork, and hands-on skills. Outcomes are demonstrated through a working prototype and technical presentation. The course coordinators will guide to the students in the journey of problem solving by providing the resources in the lab activity sessions and also monitor the students progress.

Course Objectives:

1. To guide students in transforming identified problems into implementable engineering solutions.
2. To facilitate the design, development, and testing of working prototypes using domain knowledge.
3. To mentor students in applying systematic engineering and project management approaches.
4. To develop students technical competency, teamwork, and communication through mini-project execution.

Course Outcomes:

COs	After completion of the course: Student will be able to	Bloom's Level
CO1	Interpret engineering problems and establish solution requirements in a practical context	Understand (Level L2)
CO2	Apply suitable tools and techniques to develop a working model or prototype.	Apply (Level L3)
CO3	Analyze and formulate solution strategies using relevant engineering principles	Analyze (Level L4)
CO4	Evaluate alternative approaches and select appropriate design solutions	Evaluate (Level L5)
CO5	Develop a functional working prototype using suitable tools and techniques	Create (Level L6)

CO-PO-PSO Mapping:

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2		1								2	2	
CO2	3	2	2	2	2			2			1	3	2	
CO3	3	3	3	1	1						1	3	2	
CO4	2	2	3	2	2	1		1			1	3	3	
CO5			3		2			3	2	2	2			



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Assessment	
CA-I (a)	Identify a real-life problem related to the course, clearly explain it with its needs and limitations, study existing solutions, suggest different possible solutions, and choose the best one based on cost, simplicity, and practicality.
CA-II (b)	Design a working model using suitable tools, test its performance, improve it based on results, and finally present the working solution with a simple report.
ESE (c)	Assigned Task Completion.

Sr. No.	List of Experiments/Activities
1.	To identify an open-ended problem related to the course for the mini-project.
2.	To define the problem with its objectives, basic requirements, and limitations.
3.	Literature review/survey of existing solutions and understand their drawbacks.
4.	To identify different possible solutions using course-related concepts.
5.	To select the best solution based on different criteria i.e. simplicity, cost, and practicality.
6.	To prepare the design, list of materials and use the required tools for the solution.
7.	To build a basic working model or prototype using available resources.
8.	To test the model and check whether it meets the expected results.
9.	To improve the model based on testing results and feedback.
10.	To present the final mini-project with a simple report including method, results, and conclusion.

Sr. No.	Textbooks
1.	Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Berg Publishers.
2.	Karl T. Ulrich, Steven D. Eppinger, Product Design and Development, McGraw-Hill Education.
Sr. No.	Reference Books
1.	Mahnaz MoallemWoei Hung Nada Dabbagh, The Wiley Handbook of Problem-Based Learning, Wiley, 2019.
2.	Kothari, C. R., & Garg, Research Methodology: Methods and Techniques, 2nd Revised Edition, 2019- New Age International Publishers, New Delhi.
Sr. No.	Web Resources
1.	NPTEL Online Courses- Problem Based learning, NITTTR. (https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr20_ed12)



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Course Title: Remote Sensing and Geographic Information Systems**Course Code: CE254504****Course Category: OE II**

Teaching Scheme	Examination Scheme	
Lectures: 02 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks
Course Prerequisite: • Basic Computer Knowledge • Fundamentals of Mathematics (graphs, coordinates) • Basic Programming Logic • Basic Physics (light, energy concepts)		
Course Description: This course introduces Remote Sensing and GIS technologies for analyzing Earth systems, environmental monitoring, smart cities, and data-driven decision-making. It integrates satellite data, spatial analysis, and AI-based applications, making it highly relevant for multidisciplinary engineering students.		
Course Objectives: 1. To understand fundamentals of remote sensing and GIS. 2. To analyze spatial data using modern tools and techniques. 3. To apply GIS in engineering, environment, and smart systems. 4. To integrate GIS with AI, IoT, and data analytics. 5. To develop problem-solving skills using geospatial technologies.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Recall basic concepts of remote sensing and GIS	Remember (Level 1)
CO2	Explain satellite data acquisition and GIS components	Understand (Level 2)
CO3	Utilize GIS tools for spatial data analysis and mapping	Apply (Level 3)
CO4	Simplify geospatial problems using RS-GIS integration	Analyze (Level 4)
CO5	Assess AI-enabled GIS-IoT integrated framework for real-world applications and intelligent decision-making	Evaluate (Level 5)

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CO-PO-PSO Mapping

CO-PO-PSO Mapping														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	1	-	-	-
CO2	3	3	2	2	2	1	-	-	-	-	1	-	-	-
CO3	3	3	3	3	3	-	-	-	-	-	2	-	-	-
CO4	3	3	3	3	2	2	-	-	-	-	2	-	-	-
CO5	3	3	3	3	3	2	-	-	-	-	3	-	-	-

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Fundamentals of Remote Sensing Definition and principles of Remote Sensing, Electromagnetic Spectrum, Energy interactions with atmosphere and Earth surface, Platforms: Satellite, UAV, Drone, Types of sensors (Active & Passive), Resolution concepts: Spatial, Spectral, Temporal, Radiometric	4Hrs.
Unit 2	Satellite Systems and Data Acquisition Satellite orbits (Geostationary & Polar). Indian satellites (IRS, Cartosat, Resourcesat), Data formats and image interpretation, Digital image basics (pixels, bands), Introduction to Google Earth Engine & open datasets	4Hrs.
Unit 3	Fundamentals of GIS GIS definition and components, Spatial data models: Raster & Vector, Coordinate systems and projections, GIS data input, storage, and management, Database concepts for GIS	4Hrs.
Unit 4	Spatial Analysis and Mapping Map creation and thematic mapping, Overlay analysis, Buffer analysis, Network analysis, DEM (Digital Elevation Model) basics	4Hrs.
Unit 5	Integration with AI, IoT & Engineering Applications GIS with Machine Learning (classification, clustering), Smart city applications, IoT-based environmental monitoring, Image classification using AI, Big data in geospatial analysis	4Hrs.
Unit 6	Applications of RS & GIS Urban planning and smart infrastructure, Disaster management (flood, earthquake, landslide), Agriculture and water resource management, Climate change impact analysis, Case studies (India-based), AI-based land use classification	4Hrs.



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Civil Engineering

Sr. No.	Textbooks
1.	Lillesand, Kiefer – Remote Sensing and Image Interpretation
2.	Kang-Tsung Chang – Introduction to GIS
3.	Anji Reddy – Remote Sensing and GIS
	Reference Books
1.	Introductory Digital Image Processing by J.R. Jensen.
2.	Introduction to Remote Sensing, James B. Campbell & Randolph H. Wynne., The Guilford Press, 2011
3.	Introduction to Remote Sensing by James B. Campbell & Randolph H. Wynne.
4.	Remote Sensing and Image Interpretation by T.M. Lillesand & R.W. Kiefer.
	Web Resources
1.	Remote Sensing and GIS IIT Guwahati, NPTEL, https://nptel.ac.in/courses/105/108/105108077/
2.	Geographic Information Systems, IIT Roorkee, NPTEL, https://onlinecourses.nptel.ac.in/noc26_ce70/preview
3.	Remote Sensing: Principles and Applications, NPTEL, http://www.digimat.in/nptel/courses/video/105101206/L62.html
4.	Application of AI ML on Geospatial data, YouTube Video, https://www.youtube.com/watch?v=a0FF26-uuuk



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Civil Engineering

Course Title: Town Planning
Course Code: CE254505

Course Category: OE II

Teaching Scheme	Examination Scheme	
Lectures: 02 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks

Course Prerequisite:

- Basic knowledge of civil engineering concepts, especially related to infrastructure and construction.
- Fundamental understanding of building planning and construction, including building components and layout principles.
- Awareness of urban issues and infrastructure requirements in modern cities.

Course Description: This course explains the technical and artistic process of designing, managing, and regulating land use, infrastructure, and the physical environment of cities and communities. It aims to ensure orderly growth, improve quality of life, and create sustainable, functional, and aesthetically pleasing living spaces.

Course Objectives:

1. To understand the basic concepts of town and urban planning and identify their essential attributes in city development.
2. To study the elements of town planning and the regulations governing land use, zoning, and infrastructure development.
3. To develop knowledge of planning and design techniques for different housing systems and residential layouts.
4. To understand the concept, features, and importance of smart city development in modern urban environments.

Course Outcomes:

COs	After completion of the course, students will be able to	Bloom's Level
CO1	Identify elements of town planning and its regulations.	Remember (Level 1)
CO2	Understand town and Urban planning and their essential attributes.	Understand (Level 2)
CO3	Implement guidelines provided by standard authorities.	Apply (Level 3)

CO-PO Mapping

CO-PO Mapping											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	–	–	–	–	1	–	–	–	–	–
CO2	3	–	–	–	–	1	–	–	–	–	–
CO3	2	–	2	1	2	3	3	2	1	–	1



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Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Introduction to Town Planning Necessity and scope of Town Planning, Brief history, Greek and Roman Towns, Planning in ancient India - Indus Valley Civilization, Vedic Period, Buddhist Period, Medieval Period, Mogul Period, British Period, Post-Independence Period, Theories in urban and regional planning.	4 Hrs.
Unit 2	Planning Process by Town Planners Town Planners of Modern Era and their theories like Garden City Concept, Sector Model, Radiant City, Radburn Superblock, Present Status of Town Planning in India, Efficiency Measures, Planners skills, Integrated Area Planning in India. Distribution and sizes of Settlements.	4 Hrs.
Unit 3	Growth of Towns Layout of Residential Units, Neighbourhood Unit Planning, Radburn Plan, Grid Iron Pattern, Shoe String Development, Growth Pattern of Towns, Concentric Satellite, Ribbon Development, Scattered growth.	4 Hrs.
Unit 4	Town Aesthetics and Urban Roads Elements of Town, Various Zones, Development Control Rules and Building Bye Laws, Urban Roads: Objective, Classification, Road Networks, Data Collection Surveys, Town aesthetics, Landscape Architecture, Suitability of Trees, Treatment of Traffic Islands, Open Spaces Walkways Public Sit-outs, Continuous Park System, Green ways. Town Planning works with reference to M.R.T.P. Act, Land Acquisition Act, Necessity and procedure of acquisition.	4 Hrs.
Unit 5	Introduction to Smart Cities Definition, Concept, Need and importance, Benefits of smart cities, History of Smart city in India, Features & components of a smart city, Characteristics and factors of smart cities, Smart structures, Classification of smart structures, Challenges faced in developing smart cities, Scope of smart cities, Worldwide Policies for Smart City. Government of India: India "100 Smart Cities" Policy and Mission, Smart Cities in India, Case Studies of Smart City.	4 Hrs.
Unit 6	Planning and Management of Smart Cities Dimension of Smart Cities, Smart Construction, Planning & Design, Theory and principles, Sustainable Building- Housing, Introduction to Green Buildings, Features of green building rating systems in India: LEED, GRIHA, Energy Saving System, Solar Energy for Smart City, Project Management	4 Hrs.



Chandrabhela
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Sr. No.	Textbooks
1.	Hiraskar G.K. (2018) "Town and country Planning" Dhanpat Rai Publication, N. Delhi
2.	Rangawala S.C. (2015) "Town Planning", Charotar Publications, Anand
3.	Sundaram K.V. (1978) "Urban and Regional Planning in India", Vikash Publishing House P.L
4.	MRTD Act 1966 & 2002
5.	Land Acquisition Act – 1894
6.	Misra S. N. (1984) "Rural Development Planning-Design and Method", Satvahan Publications, N. Delhi
	Reference Books
1.	Eisner S. and Gallion A. (1993) "The Urban Pattern".
2.	Alfredo Barton and Raymond Manning "Smart Cities: Technologies, Challenges and Future Prospects".
3.	Krishna Kumar, Gaurav Saini, Duc Manh Nguyen, Narendra Kumar, Rachna Shah "Smart Cities Concepts, Practices, and Applications"
	Web Resources
1.	Introduction to Urban Planning, NPTEL, https://nptel.ac.in/courses/124107158
2.	Urban Services Planning, NPTEL, https://nptel.ac.in/courses/124105163
3.	Smart Cities, NPTEL, https://nptel.ac.in/courses/105106832



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Civil Engineering

Course Title: Operation Research
Course Code: CE254506

Course Category: OE II

Teaching Scheme	Examination Scheme	
Lectures: 02 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 02	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks
Course Prerequisite: • Probability distributions • Regression analysis • Graphs and networks • Network flows		
Course Description: Operations Research (OR) is an interdisciplinary field that uses mathematical modeling, statistical analysis, and optimization techniques to support better decision-making and efficient resource allocation in complex systems. The course introduces students to quantitative methods used to analyze problems in areas such as business, engineering, logistics, manufacturing, finance, and public systems.		
Course Objectives: After Completing this course, student will have 1. Understand Decision-Making Techniques, learn how to apply scientific and mathematical methods to make optimal decisions in complex situations. 2. Develop the ability to translate practical problems (business, engineering, logistics, etc.) into mathematical models. 3. Study techniques such as Linear Programming, Transportation Models, Assignment Problems, and Network Analysis to find the best possible solution under given constraints. 4. Learn how to allocate limited resources (money, manpower, materials, time) efficiently to maximize profit or minimize cost.		

Course Outcomes:		
COs	After completion of the course students will be able to	Bloom's Level
CO1	Adopt Operation Research tools and techniques while working in industry.	Remember (Level 1)
CO2	Understand the problem statement with computational approach.	Understand, (Level 2)
CO3	Apply various models to propose suitable outcomes.	Apply (Level 3)
CO4	Examine various decision-making tools to propose best suitable alternatives, at large.	Analyze (Level 4)



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 Civil Engineering

CO-PO Mapping

CO-PO Mapping											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	-	-	2	1	1	1	-	2	1
CO2	3	2	-	3	2	-	-	-	1	1	1
CO3	2	2	2	2	1	1	-	-	1	2	1
CO4	2	2	1	2	2	2	1	1	1	2	1

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

Course Contents		
Unit 1	Introduction to Operation Research: Introduction, History of operation research, Stages of development operation research, OR tools and techniques, Applications of Operation research, modelling approach. Limitations of operation research.	4 Hrs.
Unit 2	Linear Programming and Graphical Analysis: Introduction to linear programming, Assumptions, Linear programming model, Formulation with different types of constraints, Graphical analysis of linear programming, Graphical linear programming solution.	4 Hrs.
Unit 3	Simplex Method: Simplex Method: Introduction, Basics of simplex method, Simplex method computation, Algebra of the simplex method, Simplex method in tabular form, Simplex method in matrix form, Tie breaking in the simplex method.	4 Hrs.
Unit 4	Assignment Problems: Introduction, assignment problems, unbalanced assignment problem, balanced assignment problems, infeasible assignment problem, minimization & maximization.	4 Hrs.
Unit 5	Transportation Problems: Introduction, methods for initial basic feasible solution, balanced transportation problem, minimization & maximization.	4 Hrs.
Unit 6	Vogel's approximation method: Vogel's approximation method, optimization, modified distribution method, streamlined simplex method for the transportation problem, dual of the transportation problem.	4 Hrs.



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Sr. No.	Textbooks
1.	Gupta P. K., Hira D. S. "Operation Research" S Chand Publishers, 2006
2.	Taha H. A. "Operation Research", Pearson, 2014
3.	G. Srinivasan "Operations Research: Principles and Applications", PHI Learning Pvt. Ltd.
	Reference Books
1.	Vohra, N. D. "Operations Research", Tata McGraw Hill Co., New Delhi.
2.	Wagner, "Operation Research", Wiley Eastern Ltd., New Delhi
3.	Zhamb L.C., "Quantitative Techniques in Management", Vol. I
	Web Resources
1.	https://www.informs.org
2.	https://www.ormm.net
3.	https://ocw.mit.edu



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Gallopelle
Chairman, BoS
Civil Engineering

Course Title: Building Construction and Materials**Course Code: CE254402****Course Category: MDM-II****Teaching Scheme****Examination Scheme**

Lectures: 03 hrs. / week

CA-1

10 Marks

Tutorial: --

CA-2

10 Marks

Credits: 03

MSE

20 Marks

Semester: Second Year (Semester IV)

ESE

60 Marks

Course Prerequisite:

Basic knowledge of Engineering Drawing (plans, elevations, sections)

Fundamental understanding of building materials such as bricks, stone, steel, and timber.

Familiarity with basic building components like foundations, walls, floors, and roofs.

Course Description: This course introduces the fundamentals of building construction and materials used in civil engineering, including masonry, foundations and damp proofing. It also covers timber, steel, modern materials, and smart construction technologies, with emphasis on construction practices and material selection.

Course Objectives:

1. To understand the fundamentals of building construction and foundation systems.
2. To learn brickwork, masonry, and basic construction techniques.
3. To study building components such as arches, lintels.
4. To understand properties, selection, and applications of traditional and modern construction materials.

Course Outcomes:

COs	After completion of the course students will be able to	Bloom's Level
CO1	Recall basic concepts, terminology, and types of building construction and materials.	Remember (Level 1)
CO2	Describe methods of foundation, masonry, and building components.	Understand (Level 2)
CO3	Illustrate construction techniques and material properties in building works.	Apply (Level 3)
CO4	Analyze building systems, failures and materials for safety and performance.	Analyze (Level 4)

CO-PO-PSO Mapping

CO-PO-PSO Mapping											
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	-	-	-	-	-	-	1
CO2	3	2	2	2	1	-	-	-	-	2	2
CO3	3	2	2	1	2	-	-	-	-	2	2
CO4	3	3	3	2	1	-	-	-	-	2	2



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Chandamole
Chairman, BoS
Civil Engineering

Assessment	
CA-1 (a)	Subjective Test / Assignment/ MCQ Test etc.
CA-2 (b)	Subjective Test / Assignment/ MCQ Test etc.
MSE (c)	Subjective Test
ESE (d)	End Semester Exam

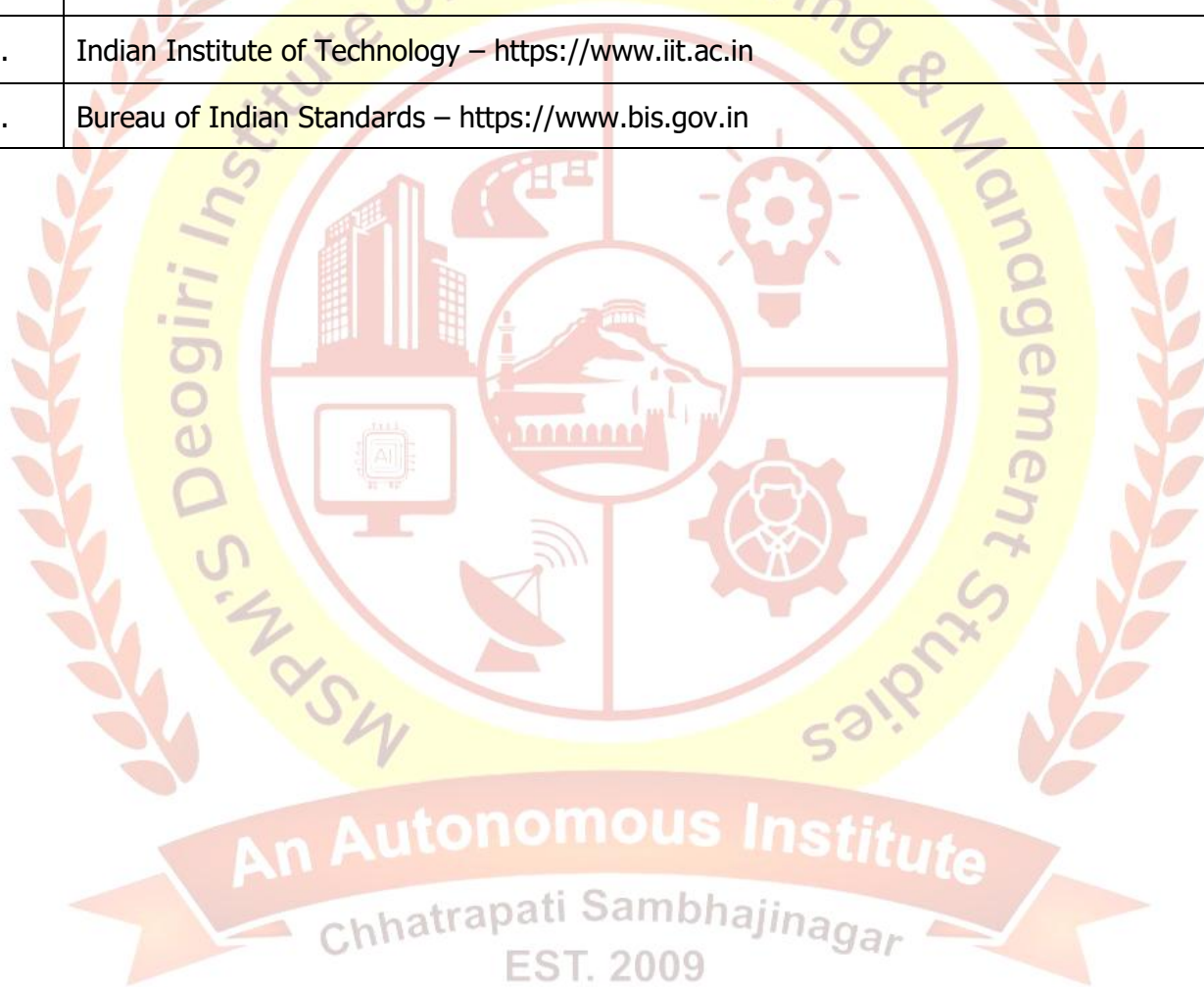
Course Contents		
Unit 1	Masonry Construction Stone masonry; classification of stone masonry; definitions of masonry terms. Brickwork: qualities of good bricks; classification of bricks; terms used in brickwork; types of bonds; principles of construction. Reinforced brickwork; composite masonry; parapets, copings, sills, corbels; brief introduction to cavity walls, load-bearing walls, hollow concrete blocks, lightweight blocks, fly ash blocks.	6 Hrs.
Unit 2	Building foundations Introduction, function, necessity and types of foundations, details of deep and shallow foundations, loads on foundations. causes of failures and remedial measures, bearing capacity of soil, foundations on black cotton soils, settlement of foundations, setting out, excavation and timbering of foundation trenches, load-bearing and framed structures.	6 Hrs.
Unit 3	Lintel, Arches and Damp Proofing Introduction, classification of lintel, loading on lintel. Arch: Terms used in arch, Classification of arch, Stability of arch, Construction of arch. Damp proofing: Cause of dampness, effect of dampness, method of damp proof, material use for damp proofing course, D.P.C. Treatment in building.	6 Hrs.
Unit 4	Diverse materials & Floor Finishes Glass, Aluminum, Asbestos, Asphalt, Bitumen, Cork, Gypsum, Fly ash. Rubber, adhesives, Mangalore tiles, Terracotta, sound absorbent materials. Floor Finish – mud, murram, Tiles, flag stone, cement concrete, Terrazzo, Mosaic, Asphalt, Fiber Reinforced Polymer.	6 Hrs.
Unit 5	Timber & Steel Timber - Soft wood, hard wood, defects in timber, Qualities of good timber, preservation of timber, Seasoning of timber, Plywood. Steel – Manufacturing of steel, use of steel, factors affecting physical properties of steel, market forms of steel, properties of mild steel, preventive measures for corrosion.	6 Hrs.
Unit 6	Smart Construction Materials Definition, Principles of Piezo-electricity, materials (Polymers and Ceramics), sensors (Piezo-electric sensor, strain gauge, shear sensor, in-plane and out of plane sensor, accelerometer), smart composites Electrostrictive Materials, Magnetostrictive materials, Magnetoelectric materials, Magnetorheological fluids, Electrorheological fluids, Shape Memory materials.	6 Hrs.



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Civil Engineering

Sr. No.	Textbooks
1.	B.C. Punmia, Building Construction, Laxmi Publication
2.	Braja M. Das, Principles of Foundation Engineering
3.	M. L. Gambhir, Building Construction: Principles, Materials, and Systems.
	Reference Books
1.	B. K. Sharma, Construction Materials and Practices
2.	Sushil Kumar, Building Construction, Standard Publishers.
3.	S. K. Sharma and Gurucharan Singh, Building Construction –Standard Publishers.
4.	P. C. Varghese, Building Construction PHI Learning Pvt. Ltd.
	Web Resources
1.	National Programme on Technology Enhanced Learning (NPTEL) – https://nptel.ac.in
2.	Indian Institute of Technology – https://www.iit.ac.in
3.	Bureau of Indian Standards – https://www.bis.gov.in



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Civil Engineering

Course Title: HMM II
Course Code: CE254213

Course Category: Honors

Teaching Scheme

Examination Scheme

Lectures: 04 hrs. / week

CA-1

10 Marks

Tutorial: --

CA-2

10 Marks

Credits: 04

MSE

20 Marks

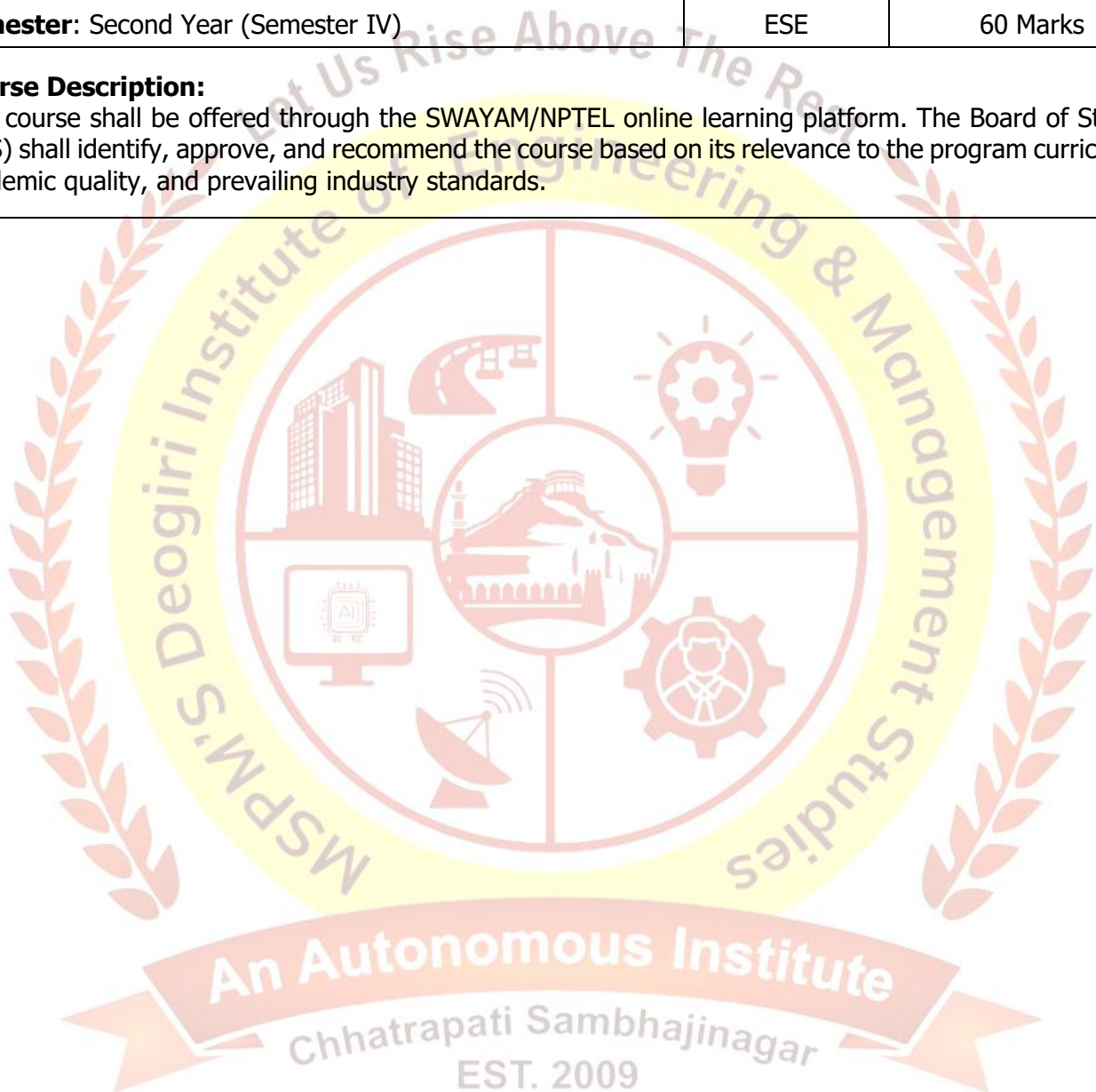
Semester: Second Year (Semester IV)

ESE

60 Marks

Course Description:

This course shall be offered through the SWAYAM/NPTEL online learning platform. The Board of Studies (BoS) shall identify, approve, and recommend the course based on its relevance to the program curriculum, academic quality, and prevailing industry standards.



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Civil Engineering

Course Title: DM II

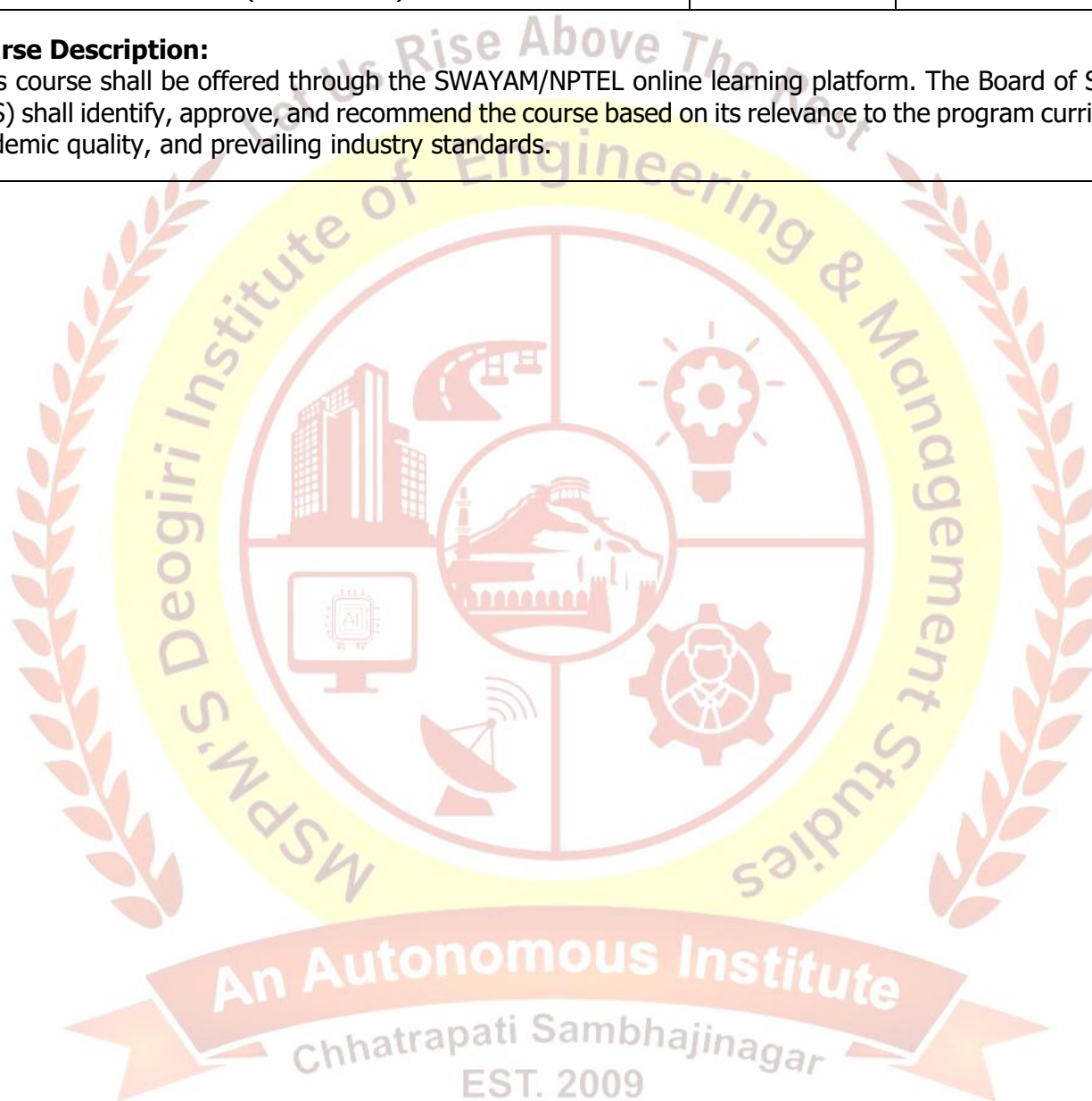
Course Code: CE254214

Course Category: Double Minor

Teaching Scheme	Examination Scheme	
Lectures: 04 hrs. / week	CA-1	10 Marks
Tutorial: --	CA-2	10 Marks
Credits: 04	MSE	20 Marks
Semester: Second Year (Semester IV)	ESE	60 Marks

Course Description:

This course shall be offered through the SWAYAM/NPTEL online learning platform. The Board of Studies (BoS) shall identify, approve, and recommend the course based on its relevance to the program curriculum, academic quality, and prevailing industry standards.



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