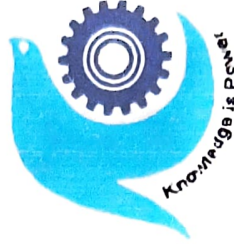


Shanti Education Society's
A. G. PATIL INSTITUTE OF TECHNOLOGY, SOLAPUR.
An autonomous institute affiliated to DBATU, Lonere.



Second Year B.Tech.in
Civil Engineering

Structure and Curriculum
(w.e.f.AcademicYear2026-2027) As per NEP 2020

Recommended in BOS (Civil) Meeting dated: 22/05/2026
Approved by Academic council Meeting dated: 26/05/2026


Prof. T. D. Maslekar
BOS Chairmen Civil
engineering


Prof. A. S. Ligade
Member Secretary
Academic council


Prof. D. W. V. Potdar
Principal
AGPIT, Solapur.

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Salient Features of the Autonomous Curriculum Framework

Department of Civil Engineering

1. Multiple Entry and Exit options are provided at the end of every academic year as per NEP guidelines.
2. The curriculum includes Open Electives (OE), Vocational and Skill Enhancement Courses (VSEC), Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), Value Education (VE), and Co-Curricular Courses (CC) along with Program Core and Program Elective courses.
3. Provision of mandatory Internship / Industrial Training / Field Training to enhance industry exposure and practical knowledge of students.
4. Credits are allotted for Value Education, Ability Enhancement, Skill Enhancement and Co-Curricular Activities for holistic development of learners.
5. Mandatory Non-Credit Courses are included to develop professional ethics, environmental awareness, communication skills and lifelong learning abilities.
6. Interdisciplinary and multidisciplinary learning opportunities are provided through Open Electives, Minor Programs and multidisciplinary course options.
7. Skill-based and outcome-oriented courses are incorporated to improve employability, entrepreneurship and practical competency of students.
8. Provision for online learning through SWAYAM, NPTEL, MOOCs and other approved digital learning platforms is included in the curriculum structure.
9. Learners are provided flexibility to choose elective courses based on their interests, career goals and emerging industry requirements.
10. Internship, field projects, mini projects and skill-based courses are integrated at various levels to support experiential learning and multiple exit pathways.
11. The curriculum framework is designed with flexibility to cater to different categories of learners such as advanced learners, regular learners and students opting for exit pathways.

Course Abbreviations and Types of Courses

Sr. No.	Abbreviation	Type of Course
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Program Core Course
4	PEC	Program Elective Course
5	MDM	Multidisciplinary Minor
6	OE	Open Elective
7	VSEC	Vocational and Skill Enhancement Course
8	AEC	Ability Enhancement Course
9	EEM	Entrepreneurship, Economics and Management Course
10	IKS	Indian Knowledge System
11	VEC	Value Education Course
12	CC	Co-Curricular Course
13	RM	Research Methodology
14	CEP / FP	Community Engagement Project / Field Project
15	PR	Project
16	IT / WIL	Internship / Work Integrated Learning
17	MC	Mandatory Course
18	ISE	In Semester Evaluation
19	ESE	End Semester Examination
20	MSE	Mid Semester Examination
21	L	Lecture
22	T	Tutorial
23	P	Practical
24	S	Self Study

Semester wise Credit Distribution

Course Category	As per NEP GR	AGPIT Credits	CC	As per NEP GR	AGPIT Credits
BSC/ESC	30	28	BSC	14-18	16
			ESC	16-12	12
Program Courses	64-76	77	PCC	44-56	60
			PEC	20	17
Multidisciplinary Courses	22	23	MDM	14	15
			OE	8	08
Skill Courses	8	9	VSEC	8	09
Humanities, Social Science & Management (HSSM)	14	11	AEC	4	05
			EMC	4	01
			IKS	2	02
			VEC	4	03
Experiential Courses	22	20	RM	4	04
			EL	2	01
			PR	4	03
			IN/OJT	12	12
Liberal Learning Courses	4	04	CC	4	04
Total Credits	160-176	172		160-176	172

Semester wise Credit Distribution

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	7	7							15
Engineering Science Course		7	7							13
Programme Core Course (PCC)	Program Courses	1	2	12	14	8	12	11		60
Programme Elective Course (PEC)						6	6	3	2	17
Multidisciplinary Minor (MDM)	Multidisciplinary Courses			2	2	4	2	3	2	15
Open Elective (OE) Other than a particular program				2	3	3				08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	2	2	1	1	1	1	1		09
Ability Enhancement Course (AEC-01, AEC-02)	Humanities Social Science and Management (HSSM)	3	-		2					05
Entrepreneurship/Economics/Management Courses				1						01
Indian Knowledge System (IKS)			2							02
Value Education Course (VEC)				2	1					03
Research Methodology	Experiential Learning Courses								4	04
Comm. Engg. Project (CEP)/Field Project (FP)				1						01
Project							1	2		03
Internship/ WIL									12	12
Co-curricular Courses (CC)	Liberal Learning Courses	2	2							04
Total Credits (Major)		22	22	21	23	22	22	20	20	172

List of MDM Courses Available to other branch Students

Semester	Category	Subject code	Subject Name	Total Credits
SEM- III	Foundation Course	25UGCVMD305	Introduction to Civil Infrastructure	2
SEM- IV	Applied Engineering Course	25UGCVMD405	Environmental Management & Planning for Sustainable Development	2
SEM- V	Applied Engineering Course	25UGCVMD505	Basics of Construction Technology	4
SEM- VI	Specialization Course	25UGCVMD606	Smart Buildings and Smart Cities use of AI	2
SEM- VII	Specialization Course	25UGCVMD705	Modern Transport Infrastructure	3
SEM- VIII	Mini Project	25UGCVMD803	Inter disciplinary Mini Project	2

Autonomous Curriculum Scheme and Structure
Second Year B.Tech. in Civil Engineering (Sem- III and IV)
Effective from A.Y. 2026–27

Second Year B. Tech. in Civil Engineering
Semester- III (w. e. f. 2026-27)

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme Theory Course		Credit
			L	T	P		Max. Marks	Min.% for passing	
25UGCVPC301	PCC	Mathematics for Civil Engineering	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC302		Mechanics of Solids	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC303		Concrete Technology	2	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
25UGCVPC304		Building Planning construction and Drawing	2	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
Refer MDM Bucket 25UGCVMD305	MDM	Multidisciplinary Minor -I	2	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
Refer OE Bucket 25UGCVOE306	OE	Open Elective-I	2	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
25UGCVIE307	IED	Entrepreneurship and Business Innovation	-	-	2	ISE	25	40	1
25UGCVVE308	VEC	Universal Human Values	2	-	-	ISE	25	40	2
25UGCVPC309L	PCC	Concrete Technology Lab	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVPC310L		Building Planning construction and Drawing Lab	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVVS311	VSEC	Civil Engineering Software (Auto Cad)	-	-	2	ISE	25	40	1
25UGCVFP312	FP	Community Engagement Project		-	2	ISE	25	40	1

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme Theory Course		Credit
			L	T	P		Max. Marks	Min. % for passing	
			16	2	10		850		21
	Total Credits								21
	Total Marks								800
	Total Contact Hr.								28

CUMULATIVE CREDITS: 44+ 21 = 65

List of MDM-I Courses Available to Civil Engineering Students

Department	Course Code	Course Title	Semester
Mechanical	25UGMEMD304	Manufacturing Process	III
Computer Engineering	25UGCCEMD305	Data Structure	III
Electronics & Telecommunication	25UGETCMD305	Electronic Devices and Circuits	III

List of Open Elective Courses

Course Code	Open Elective-I (Credit-2) Sem-III
25UGCVOE306A	Environment Impact Assessment
25UGCVOE306B	Entrepreneurship and Startup Management
25UGCVOE306C	Sustainable Innovation and Green Technologies
25UGCVOE306D	Sustainable Waste Management and Circular Economy
25UGCVOE306E	Data Analytics Using Advanced Spreadsheets
25UGCVOE306F	Engineering Management and Professional Practices

Second Year B. Tech. in Civil Engineering
Semester- IV (w. e. f. 2026-27)

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme		Credit
			L	T	P		Max. Marks	Min.% For Passing	
25UGCVPC401	PCC	Structural Mechanics-I	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC402		Hydraulics Engineering	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC403		Surveying	2	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
25UGCVPC404		Transportation Engineering	2			ISE	20	40	2
						MSE	20		
						ESE	60		
Refer MDM Bucket 25UGCVMD405	MDM	Multidisciplinary Minor –II	2	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
Refer OE Bucket 25UGCVOE406	OE	Open Elective-II	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVAE407	AEC	Professional Aptitude and Proficiency	2	-	-	ISE	50	40	2
25UGCVVE408	VEC	Environmental Education	1	-	-	ISE	50	40	1
25UGCVPC409L	PCCL	Hydraulics Engineering Laboratory	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVPC410L		Surveying Laboratory	-	-	2	ISE	30	40	2
						ESE	20		
25UGCVPC411L		Transportation Engineering Laboratory	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVVSE412	VSEC	Civil Engineering Software (BIM Architecture)	-	-	2	ISE	30	40	1
						ESE	20		
			18	2	8				
								Total Credits	23
								Total Credits	23
								Total Marks	900
								Total Contact Hr.	28

CUMULATIVE CREDITS: 65 + 23 = 88

List of MDM-II Courses Available to Civil Engineering Students

Department	Course Code	Course Title	Semester
Mechanical	25UGMEMD404	Mechanical System Design	IV
Computer Engineering	25UGCEMD406A	Design and Analysis of Algorithms	IV
Electronics & Telecommunication	25UGETCMD405	Applied Electronics	IV

List of OE- II Courses

Course Code	Open Elective-II (Credit-3) Sem-IV
25UGCVOE406A	Supply Chain Management
25UGCVOE406B	Digital Marketing
25UGCVOE406C	Engineering Economics
25UGCVOE406D	Drone Technology
25UGCVOE406E	Computer Aided Modeling
25UGCVOE406F	Data Structure Using Java

**Autonomous Curriculum Scheme and Structure
Third Year B.Tech. in Civil Engineering (Sem- V and VI)
Effective from A.Y. 2027-28**

Third Year B. Tech. in Civil Engineering
Semester- V (w. e. f. 2027-28)

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme Theory Course		Credit
			L	T	P		Max. Marks	Min. % for passing	
25UGCVPC501	PCC	Design of Steel Structures	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC502	PCC	Water Supply Engineering	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPE503	PEC	Program Elective Course-I	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPE504	PEC	Program Elective Course-II	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVMD505	MDM	Multidisciplinary Minor-III	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVOE506	OE	Open Elective-III	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC507L	PCC	Design of Steel Structures Lab.	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVPC508L	PCC	Water Supply Engineering Lab.	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVMD509L	MDM	Multidisciplinary Minor –II Lab	-	-	2	ISE	50	40	1
26CVS5VS510	VSEC	Civil Engineering Software (BIM structures)	-	-	2	ISE	30	40	1
						ESE	20		
			18	2	8		800		22
	Total Credits								22
	Total Marks								800
	Total Contact Hr.								28

CUMULATIVE CREDITS: 88 + 22 = 110

List of Programme Elective Courses (PEC)- I and II

Domain	Construction Management A	Structural Engineering B	Environmental Engineering C	Geotechnical Engineering D	Transportation Engineering E	Surveying & Geospatial F
PE-I	Engineering Management	Structural Mechanics – III	Advanced Water & Wastewater Treatment	Geotechnical Site Investigation	Urban Mobility Planning & Intelligent Transport	Remote Sensing
PE-II	Project Management	Elements of Earthquake Engineering	Air Pollution & control	Earth Retaining Structures	Pavement Analysis & Design	GIS & GPS

List of MDM-III Courses Available to Civil Engineering Students

Department	Course Code	Course Title	Semester
Mechanical	25UGMEMD507	Thermal Engineering	V
Computer Engineering	25UGCEMD506	Python Programming	V
Electronics & Telecommunication	25UGETCMD506	Analog and Digital Circuits	V

List of Open Elective Courses

Course Code	Open Elective-III (Credit-3) Sem.-V
25UGCVOE506A	Operational Research
25UGCVOE5506B	Project Management
25UGCVOE506C	Cyber Security
25UGCVOE506D	Hydrogen and Fuel cell Technology
25UGCVOE506E	Organizational Behavior
25UGCVOE506F	Introduction to R
25UGCVOE506G	Foreign Language-I (German/Japanese / French)
25UGCVOE506H	Artificial Intelligence
25UGCVOE506I	Human Resource Management

Third Year B. Tech. in Civil Engineering
Semester-VI (w.e.f. 2027-28)

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme Theory Course		Credit
			L	T	P		Max. Marks	Min. % for passing	
25UGCVPC601	PCC	Design of Concrete Structures	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC602		Geotechnical Engineering	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC603		Waste water Engineering	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPE604	PEC	Program Elective Course–III	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPE605		Program Elective Course- IV	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVMD606	MDM	Multidisciplinary Minor –IV	2	-	-	ISE	20	40	2
						MSE	20		
						ESE	60		
25UGCVPR607	PR	Project Phase – I	-	-	2	ISE	50	40	1
						ESE	50		
25UGCVPC608L	PCC	Concrete Structure Lab	-	-	4	ISE	30	40	2
						ESE	20		
25UGCVPC609L		Geotechnical Engineering Lab	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVVS610	VSEC	Civil Engineering Software (STAAD)	-	-	2	ISE	30	40	1
						ESE	20		
			17	2	10		800		22
	Total Credits								22
	Total Marks								800
	Total Contact Hr.								29

CUMULATIVE CREDITS: 110 + 22 = 132

List of Programme Elective Courses (PEC) - III and IV

Domain	Construction Management A	Structural Engineering B	Environmental Engineering C	Geotechnical Engineering D	Transportation Engineering E	Surveying & Geospatial F
PE-III	Material testing and Evaluation	Advanced Design of Steel Structure	Industrial Waste Treatment	Pile foundation	Traffic Flow Theory & Simulation	Hydrographic & Photogrammetric Surveying
PE-IV	Construction material & Equipment cost dynamics	Design of Prestressed concrete	Solid and Hazardous waste management	Geo-synthetics in Civil Engineering	Public Transport Systems & Multimodal Integration	BIM-GIS Integration for Infrastructure Planning

List of MDM-VI Courses Available to Civil Engineering Students

Department	Course Code	Course Title	Semester
Mechanical	25UGMEMD606	Finite Element Method	VI
Computer Science	25UGCEMD606	Database Management System	VI
Electronics & Telecommunication	25UDETCMD605	Microprocessors and Microcontrollers	VI

Autonomous Curriculum Scheme and Structure
Final Year B.Tech. in Civil Engineering (Sem- VII and VIII)
Effective from A.Y. 2028-29

Final Year B. Tech. in Civil Engineering
Semester-VII (w.e.f. 2028-29)

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme Theory Course		Credit
			L	T	P		Max. Marks	Min.% for passing	
25UGCVPC701	PCC	Water resource Engineering	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC702		Quantity Surveying and Valuation	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC703		Foundation Engineering	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPE704	PEC	Program elective Course – V	3	1	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVMD705	MDM	Multidisciplinary Minor –V	3	-	-	ISE	20	40	3
						MSE	20		
						ESE	60		
25UGCVPC706L	PCC	Water resource Engineering lab	-	-	2	ISE	30	40	1
						ESE	20	40	
25UGCVPC707L		Quantity Surveying and Valuation Lab	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVVS708	VSEC	Civil Engineering Software (MSP)	-	-	2	ISE	30	40	1
						ESE	20		
25UGCVPR709	PR	Project Phase – II			4	ISE	20	40	2
						MSE	40	40	
						ESE	40	40	
			15	2	10		850		20
	Total Credits								20
	Total Marks								850
	Total Contact Hr.								27

PROGRESSIVE TOTAL CREDITS: 132 + 20 = 152

List of Programme Elective Courses (PEC) – V

Domain	Construction Management A	Structural Engineering B	Environmental Engineering C	Geotechnical Engineering D	Transportation Engineering E	Surveying & Geospatial F
PE-V	Construction Safety and management	Design of Bridge Engineering	Circular Economy in Civil Engineering	Soil Dynamics	Infrastructure Engineering	Digital Twin Applications In Smart Cities

List of MDM-V Courses Available to Civil Engineering Students

Department	Course Code	Course Title	Semester
Mechanical	25UGMEMD705	Renewable Energy Sources	VII
Computer Science	25UGCEMD706	Software Engineering	VII
Electronics & Telecommunication	25UGETCMD705	VLSI and Embedded System	VII

Final Year B. Tech. in Civil Engineering
Semester-VIII (w.e.f. 2028-29)

Course Code	Course Category	Name of Course	Teaching Scheme			Scheme	Evaluation Scheme Theory Course		Credit
			L	T	P		Max. Marks	Min. % for passing	
25UGCVPC801	PEC	Online Course	2	-	-	ESE	100	40	2
25UGCVRM802	RM	Research Methodologies (Online)	4	-	-	ISE	20	40	4
						MSE	20		
						ESE	60	40	
25UGCVMD803	MDM	Mini Project (MDM)	-	-	4	ISE	60	40	2
						ESE	40		
25UGCVEL804	EL	Internship/EIW	-	-	24	ISE	30	40	12
						MSE	90		
						ESE	180	40	
			6		28		600		20
	Total Credits								20
	Total Marks								600
	Total Contact Hr.								34

PROGRESSIVE TOTAL CREDITS: 152 + 20 = 172

List of Programme Elective Courses (PEC) – VIII

Course Code	Course Name	Track
25UGCVPC801A	(Online Course)	Structural
25UGCVPC801B	(Online Course)	Geotechnical
25UGCVPC801C	(Online Course)	Hydraulics
25UGCVPC801D	(Online Course)	Construction I

List of MDM-VIII Courses Available to Civil Engineering Students

Department	Course Code	Course Title	Semester
Mechanical	25UGMEMD803L	Project	VIII

List of Programme Elective Courses (PEC)

Domain	Construction Management A	Structural Engineering B	Environmental Engineering C	Geotechnical Engineering D	Transportation Engineering E	Surveying & Geospatial F
PE-I	Engineering Management	Structural Mechanics- III	Advanced Water & Wastewater Treatment	Geotechnical Site Investigation	Urban Mobility Planning & Intelligent Transport	Remote Sensing Techniques
PE-II	Project Management	Elements of Earthquake Engineering	Air Pollution & control	Earth Retaining Structures	Pavement Analysis & Design	GIS & GPS
PE-III	Material testing and Evaluation	Advanced Design of Steel Structure	Industrial Waste Treatment	Pile foundation	Traffic Flow Theory& Simulation	Hydrographic & Photogrammetric Surveying
PE-IV	Construction material& Equipment cost dynamics	Design of Prestressed concrete	Solid and Hazardous waste management	Geo-synthetics in Civil Engineering	Public Transport Systems & Multimodal Integration	BIM-GIS Integration for Infrastructure Planning
PE-V	Construction safety and management	Design of Bridge Engineering	Circular Economy in Civil Engineering	Soil Dynamics	Infrastructure Engineering	Digital Twin Applications in Smart Cities

Autonomous Curriculum Syllabus

Second Year B.Tech. in Civil Engineering (Sem- III and IV)

Effective from A.Y. 2026-27



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVPC301 MATHEMATICS FOR CIVIL ENGINEERING

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ISE	20
Tutorial	1 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisites :

Engineering Mathematics- I , Engineering Mathematics- II ,

Course Objectives:

After completing this course, the student will be able to:

CO1: Apply integral transform technique such as Laplace transform to solve ordinary differential equation

CO2: To find inverse Laplace's of functions

CO3: Solve partial differential equations of first order and partial differential equations.

CO4: Vector differentiation required in wave theory.

CO5: To study numerical integrations methods

Course Outcomes:

CO1: Solve higher order differential equation using appropriate techniques

CO2: Solve problem related to Laplace transform and application.

CO3: Solve partial differential equations of first order and partial differential equations.

CO4: Perform contour integration of complex function.

CO5: To solve numerical integrations problems.

Module 01	Laplace Transform	8hrs
Introduction, definition of Laplace transform, Transform of elementary functions, properties of Laplace transform –Linearity, First shifting theorem, second shifting theorem (without proof), transform of function multiplied by t^n , transform of function divided by t , transform of integral Unit step function, Dirac delta function, periodic function and their Laplace transform		
Module 02	Inverse Laplace Transform	6hrs
Inverse Laplace transform with partial fraction and convolution theorem Application to solve initial value problem involving ordinary differential equation with constant coefficients		
Module 03	Partial Differential Equations	7hrs
Formation of Partial differential equation by eliminating arbitrary constant and function , Equation solvable by direct integration ,Lagrange's linear equation, Method of separation of variable, Solutions of one dimensional wave equation–One dimensional heat equation–Steady state solution of two-dimensional heat equation		
Module 04	Functions Of Complex Variable	6hrs
Analytic function, Cauchy-Riemann equation in Cartesian and polar forms, Harmonic functions, Cauchy's integral theorem, Cauchy's integral formula, Residues, Cauchy's residue theorem (All theorem without proofs)		
Module 05	Solution Of Algebraic And Transcendental Equations And Numerical Integration.	7hrs
Introduction, Basic properties of equations. Regula-falsi method, Newton-Raphson Method, Newton Cotes Integration Formula: Trapezoidal rule, Simpson's Rule ($1/3^{rd}$ and $3/8^{th}$), Introduction to interpolation, Lagrange interpolation		

Internal Continuous Assessment
One Assignment on each unit
Text Books: 1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi 3. J. N. and P. N. Wartikar, "A Text of Applied Mathematics Vol. I and Vol. II", Vidyarthi Grah Prakashan, Pune. 4. B. S. Grewal "Numerical Methods in Engineering Science ", Khanna Publication, Delhi. 5. Jaggi and Mathur, "Advanced Engineering Mathematics", Dhanpatrai and Sons, Bhopal.
Reference Books: 1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10e, by Wiley India. 2. M. D. Greenberg, "Advanced Engineering Mathematics", 2e, by Pearson Education. 3. Peter V. O'Neil , "Advanced Engineering Mathematics", 7e, by Cengage Learning



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVPC302 MECHANICS OF SOLIDS

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ISE	20
Tutorial	1 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisite:

Basic Physics, Basic Chemistry, Basic Mathematics

Course Objectives:

After completing this course, the student will be able to:

- CO1:** To understand concept of various types of stresses and strains.
- CO2:** To study axial force, shear force, bending moment for determinate beams.
- CO3:** To study concept of stresses in beam.
- CO4:** To learn the concept of short and long columns.
- CO5:** To familiarize students with the behavior of columns, shafts under torsion

Course Outcomes:

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

- CO1:** Perform stress-strain analysis.
- CO2:** Draw force and bending moment distribution diagrams for determinate beams.
- CO3:** Determine stresses in beam, and distribution of stress for various cross sections.
- CO4:** Understand concept of Principal stresses and strains and perform failure analysis.
- CO5:** Analyze columns, shafts, and stresses in thin-walled members.

Module 01	Stresses and Strains	8hrs
Stresses and strains: Analysis of internal forces, normal stress, shearing stress, bearing stress, statically indeterminate members. Stress-strain diagram for different engineering materials. Hooke's law: axial and shearing deformations, Poisson's ratio: biaxial and tri-axial state of stress, State of simple shear, Elastic constants and their inter-relation, introduction to strain measurement devices, Sensors: working principle. Concept of strain energy: Elastic, plastic and rigid members, stresses due to Gradually applied loads, Suddenly applied loads, and Impact loads, Thermal stresses.		
Module 02	Axial Force, Shear Force and Bending Moment	6hrs
Axial force, shear force and bending moment in beams: concept of unbalanced forces and moments at a transverse section, axial forces, shear forces and bending moment diagram, relations among load shear and moment, introduction to moving loads.		
Module 03	Stresses in beams- bending stresses, shearing stresses& Torsion of shaft	6hrs
Simple bending: assumptions and derivation of flexural formula, economic sections, analysis of flexural action, moment of resistance, section modulus. Shearing stress: Derivation of formula, shear stress distribution for various cross sections, concept of shear flow, shear lag and shear center. Direct and bending stresses Torsion: Assumptions, derivation of torsion formulae, torsion of circular shafts, power transmission, stresses and deformation in determinate solid/hollow homogeneous shafts		
Module 04	Combined stresses and strains, and Theories of failure	6hrs
Combined stresses and strains: Analytical and graphical representation of state of combined stress at a point, absolute maximum shearing stress, principal stresses and strains, application of Mohr's circle. Theories of Failure: maximum principal stress theory, maximum principal strain theory, maximum strain energy theory, maximum shear stress theory, maximum shear strain theory.		
Module 05	Columns & Struts and Thin-Walled Structures	6hrs
Columns and Struts: Concept of short and long columns, formulae by Euler, Euler's Crippling load for different end conditions, limitations of Euler's formula, equivalent length, Rankine's formula and its applications Thin cylinders and spheres: circumferential and longitudinal stresses		

Internal Continuous Assessment
One Assignment on each unit
References:
TextBooks: 1. Singer F.L. and Pytle, 2011, “Strength of Materials”, Harper Collins Publishers, 4th Edition 2. Junnarkar S.B., 2014, “Mechanics of Structures”, Charotar Publishers, Anand, 31st edition, Khurmi R.S., 2018, “Strength of Material”, S. Chand and Co., New Delhi 3. Sadhu Singh, 1978, “Strength of Materials”, Khanna Publishers, N. Dehli 4. Prasad I.B, 1988, “A text book of Strength of Materials”, Khanna Publishers, N. Dehli 5. Timoshenko S.P. and Young D.H., 2002, “Elements of Strength of Materials”, East West Press 6. Ramamrutham S., 2011, “Strength of Materials”, Dhanpat Rai and Sons, Delhi 7. Ramamrutham S., and R. Narayanan 2020, “Theory of Structures”, Dhanpat Rai and Sons
ReferenceBook: 1. Beer F P., Jhonston E. R., John. T. D E wolf, 2017, “Mechanics of Materials” TMH 2. Popov E.P.,2015, “Introduction to Mechanics of Solids”, Prentice-Hall, Second Edition 2005 3. Crandall S.H., Dahl N.C., & Lardner T.J., 1955, “An Introduction to Mechanics of Solids”, Tata McGraw Hill, 2nd Edi, 1978 4. Nash W., 2005, “Strength of Materials Schaum’s outline series”, McGraw Hill, fourth edition 5. Punmia B. C., 2018, “Mechanics of Materials” Laxmi Publications, revised edition, 2016 6. Subramanian R., 2016, “Strength of Materials” Oxford University Press, 2nd edition
e-Resources
https://onlinecourses.nptel.ac.in/noc23_me140/preview



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVPC303 CONCRETE TECHNOLOGY

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Course Prerequisite :

Basic Physics, Basic Chemistry, Basic Mathematics

Course Objectives :

After completing this course, the student will be able to:

- CO1:** Understand the properties, classification, and selection of concrete ingredients (cement, aggregates, water, admixtures).
- CO2:** Analyze fresh and hardened concrete properties through standard laboratory tests.
- CO3:** Apply mix design principles to proportion concrete for desired strength and durability.
- CO4:** Understand special concretes and modern developments in concrete technology.
- CO5:** Evaluate durability aspects and quality control measures in concrete construction.

Course Outcomes:

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

- CO1:** Explain the properties and behavior of cement, aggregates, water, and admixtures as per IS standards.
- CO2:** Perform and interpret tests on fresh and hardened concrete (workability, strength, durability).
- CO3:** Design concrete mixes using IS 10262 and IS 456 guidelines.
- CO4:** Compare different types of special concretes (SCC, HPC, fiber reinforced, lightweight concrete).
- CO5:** Assess durability problems and recommend appropriate quality control measures for concrete structures.

Module 01	Introduction to Concrete and Ingredients of Concrete	8hrs
1. Cement: Manufacture of Portland cement, Chemical composition and Bogue's compounds, Hydration of cement and hydration products, Physical and mechanical properties, Classification and types of cement (OPC, PPC, PSC, special cements), Applications of various cement types, Standard laboratory tests on cement (fineness, consistency, setting time, soundness, strength) 2. Aggregates: Classification (fine and coarse aggregates), Physical and mechanical properties (specific gravity, bulk density, crushing strength, impact value, abrasion value), Deleterious materials and their effects, Alkali–aggregate reaction (AAR), Grading of aggregates and sieve analysis, Standard tests on aggregates 3. Water and Admixtures: Quality requirements of mixing water, Role and mechanism of admixtures in concrete Classification of admixtures: Chemical admixtures: accelerators, retarders, plasticizers, super plasticizers Mineral admixtures: fly ash, silica fume, ground granulated blast furnace slag (GGBS)		
Module 02	Fresh Concrete	6hrs
Nominal mixes and proportioning concepts, Water–cement ratio and its significance, Manufacture of fresh concrete: Batching (weight and volume batching), Mixing, Transportation, Placing and compaction, Curing methods and curing practices, Influence of temperature on concrete, Maturity concept and maturity rule, Workability: definition, factors affecting workability, Cohesion and segregation Tests on Fresh Concrete: Slump cone test, Compaction factor test, Effect of admixtures on workability, Determination of optimum admixture dosage (Marsh cone test)		
Module 03	Hardened Concrete	6hrs
Strength development of concrete, Factors affecting strength, Micro cracking and stress–strain relationship, Relationship between compressive and tensile strength, Impact strength and abrasion resistance, Durability aspects: creep and shrinkage Testing of Hardened Concrete: Destructive Tests: Compressive strength test, Flexural strength test, Split tensile strength test, Core test Non-Destructive Tests (NDT): Rebound hammer test, Ultrasonic pulse velocity (UPV) test, Pull-out test, Impact echo test		
Module 04	Concrete Mix Design	6hrs
Concept and objectives of mix design, Factors influencing mix design, Quality control in concrete production, Variability of test results and statistical considerations Acceptance criteria for concrete, Grade Designation and Code Provisions: Exposure conditions, Minimum and maximum cement content, Maximum water–cement ratio, Relevant provisions as per IS 456 Methods of Mix Design: IS Code Method, DOE Method, With mineral admixtures, Without mineral admixtures		
Module 05	Concreting Equipment and Special Concretes	6hrs
Concreting Equipment and Techniques : Batching plants, Concrete mixers, Hauling and transportation equipment, Concrete pumps, Vibrators and compaction equipment Special Concretes: Lightweight concrete, Cellular concrete, No-fines concrete, Pervious (permeable) concrete, Fibre reinforced concrete (FRC), Polymer concrete, Bacterial concrete, Self-compacting concrete (SCC), Nano-material based concrete (Nano-silica and Nano-alumina concrete)		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1) Gambhir M. L., "Concrete Technology", TataMc-GrawHill201515thedition 2) Shetty M. S., "Concrete Technology", S.Chand2005.8th edition 3) Krishna swamy, "Concrete Technology", Dhanapat Rai andSons,3rdedition
Reference Book: 1) Neville A. M., "Concrete Technology", Pearson Education 2) Neville A. M., "Properties of Concrete", Pearson Education 3) Relevant Publications by Bureau of Indian Standards, New Delhi 4) IS:10262(2009),IS:456(2009),IS4926(2003)
e-Resources
https://nptel.ac.in/courses/105102012



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
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Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVPC304 BUILDING PLANNING CONSTRUCTION AND DRAWING

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Course Prerequisite : Basic Civil Engineering

Course Objectives :

After completing this course, the student will be able to:

- CO1:** To make the students understand the functional requirements of building and its components.
- CO2:** To make the students proficient in CADD for planning and designing of building components.
- CO3:** To plan residential building using CADD tools.
- CO4:** To develop building plans as per building bylaws.

Course Outcomes:

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

- CO1:** Explain the functional requirements of building, foundations and masonry construction.
- CO2:** Design the building components for utility services.
- CO3:** Plan the G+1 residential building using CADD tools.
- CO4:** Develop the building plans as per building bylaws.
- CO5:** Design the building components for precast and pre-engineered buildings.

Module 01	Introduction to Building Construction & Site Preparation:	5 hrs
Classification of buildings as per occupancy and structure. Requirements and functions of buildings. Site selection for buildings and site investigation. Site clearance and setting out for foundation. Temporary structures: scaffolding, shoring, underpinning.		
Module 02	Building Materials and Components:	8 hrs
Masonry materials: Brick, stone, concrete blocks – types, properties, uses. Cement and Lime: Types, grades, properties, storage. Concrete: Ingredients, mix proportion, availability, suitability, methods. Steel: Structural steel and reinforcement. Timber – types and uses. Treated Timber: seasoning, defects, uses in construction. Modern and eco-friendly materials: AAC blocks, fly ash bricks, geopolymer concrete. Functions and classification of foundations. Shallow foundations: spread footing, stepped footing, raft. Deep foundations: pile foundation – types, necessity. Foundation construction procedure. Damp-proofing – causes of dampness, DPC. Walls: Load-bearing and non-load-bearing walls, cavity walls, partition walls. Lintels and arches: Types, functions, construction methods. Floors: Types of ground and upper floors – components and construction. Stairs: Terminology, classification, design considerations. Roofs: Flat and pitched roofs – types, covering materials, slope design		
Module 03	Doors, Windows, and Finishes	6 hrs
Doors and Windows: Types, materials, sizes, and fixing details, fixtures and fastenings: locks, hinges, handle. Plastering and Pointing: Materials, mixes, types of plastering, surface preparation. Painting and Varnishing: Types of paint, surface preparation, application methods.		
Module 04	Building Services and Drawing:	6 hrs
Building Services: Water supply, drainage, sanitation (brief introduction). Vertical transportation – lifts, escalators – principles and basic layout. Sound insulation and thermal insulation – cross-pts and materials. Drawing Topics: Conventional symbols and notations. Plan, section, elevation of a one/two storied building. Foundation layout, brick bond drawing, Doors & windows, staircase.		
Module 05	Planning and Design of Residential Buildings:	5 hrs
Planning and functional requirements of residential buildings – Bungalows (Detached), Twin houses (Semi-Detached), Row houses, Ownership flats, and Apartments.		

Internal Continuous Assessment
One Assignment on each unit
Text Book:
1. B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain : _Building Construction_, Laxmi Publications, 12 th Edition (2022) 2. S.K. Duggal : _Building Materials_, New Age International, 5 th Edition (2022) 3. M.L. Shah, C.M. Kale, S.Y. Patki : _Building Drawing_, Tata McGraw Hill (2010)
Reference Book:
1. SP7: 2016, _National Building Code of India_, Part IV, V, VII, IX & X, BIS, New Delhi. 2. IS 962: 1989, _Code for Practice for Architectural and Building Drawings_, BIS, New Delhi. 3. Chaudry K.R. : _Construction Technology_, Vol. 1, 2, 3 and 4, CBS Publisher. 4. Technical information Brochures, Trade Literature by reputed or product manufacturers like UltraTech, A.R. Katke and Sons. 5. A.R. Santhakumar, Arumugam, _Building Construction_, Pearson Education.
e-Resources
NPTEL, SWAYAM, BIS Website for IS Codes.



Shanti Education Society's
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OPEN ELECTIVE – I

25UGCVOE306A ENVIRONMENT IMPACT ASSESSMENT AND CLEAN TECHNOLOGY

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Course Prerequisite :

Basic Physics, Basic Chemistry, Basic Mathematics Pre-Requisites:
 A foundational understanding of Environmental Engineering.
 Basic knowledge of air, water, soil, and noise pollution.

Course Objectives :

After completing this course, the student will be able to:

The Objective of this course are:

- CO1:** To understand the fundamental concepts of EM and EIA.
- CO2:** To trace the evolution of EIA and use it as EM tool.
- CO3:** To apply environment impact assessment process for construction projects.
- CO4:** To prepare project report which is comply with environmental clearance procedure?

Course Outcomes:

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

- CO1:** Understand the fundamental concepts of EM and EIA.
- CO2:** Trace the evolution of EIA and use it as EM tool.
- CO3:** Apply environment impact assessment process for construction projects.
- CO4:** Prepare project report which is comply with environmental clearance procedure?

Module 01	Introduction	6 hrs
Environmental management, definition, scope, goals and need. International environmental movement, environmental concerns in India.		
Module 02	Policies & Programmes	6 hrs
Environmental Policies and Programmes in India, Environmental laws and Legislations, Evolution of Indian Legislations, Constitution of India.		
Module 03	Environmental Impact Assessment	6 hrs
Introduction, Purpose, Evolution, Forecasting environmental changes, Environment Impact Statement (EIS), Strategic Environmental Assessment (SEA). Screening and Scoping.		
Module 04	EIA Documentation and Processes	6 hrs
Preliminary Stages of EIA, Impact Prediction, Evaluation and Mitigation, Impact on Decisions, Cost Benefit Analysis of EIA of Construction Projects.		
Module 05	Environmental Auditing	6 hrs
Audit Methodology, Life Cycle Assessment (LCA) – Purpose, Evolution and Stages. Environment Impact Statement (EIS), Requisites of good EIS.		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1) Canter L (1996) Environmental Impact Assessment (Second Edition). McGrawHill Publishing Company, New York. 2) Environmental Management – Web course http://NPTEL.iitm.ac.in, Prof.T. V. Ramchandra. 3) UNDP (1992) Handbook and Guidelines for Environmental Management and Sustainable Development. Environment and Natural Resources Group, UNDP, New York.
Reference Book: 1) “Environmental Impact Assessment: Cutting Edge for the 21st Century” 3 Alan Gilpin, Cambridge University Press, 2000. 3) “Environmental Impact Assessment: A Guide to Best Professional Practices” 3 Charles H. Eccleston, CRC Press 5) “Environmental Impact Assessment” 3 Larry W. Canter, McGraw-Hill Education 6) Open Source Learning Resources: 1.https://archive.nptel.ac.in/courses/106/106/106106127/ 7) Virtual Labs: https://cse.iitkgp.ac.in/~rkumar/pds-vlab/exp1.1/index.html



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OPEN ELECTIVE – I
25UGCVOE306B ENTREPRENEURSHIP AND STARTUP MANAGEMENT

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Course Prerequisites

Students should possess basic knowledge of:

Economics and Commerce, Business Communication, Marketing Fundamentals, Financial Management

Course Objectives :

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

- CO1:** Understand the fundamentals, evolution, importance, challenges, and success factors of entrepreneurship.
- CO2:** Compare different types of entrepreneurship and entrepreneurial decision-making in various business environments.
- CO3:** Examine the contribution of entrepreneurs, especially women entrepreneurs, to economic and social development.
- CO4:** Develop entrepreneurial competencies including creativity, innovation, leadership, negotiation, and risk management.
- CO5:** Understand various forms of business organizations and the legal framework governing business enterprises.
- CO6:** Analyze causes of entrepreneurial failure and formulate strategies for sustainable business growth.

Course Outcomes:

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

- CO1:** Explain entrepreneurial concepts, opportunities, and influencing factors.
- CO2:** Analyze entrepreneurial decision-making and business opportunities.
- CO3:** Evaluate the role, challenges, and achievements of women entrepreneurs.
- CO4:** Demonstrate entrepreneurial skills required for establishing and managing ventures.
- CO5:** Differentiate forms of business organizations and their legal implications.
- CO6:** Assess entrepreneurial failures and recommend corrective strategies for business sustainability.

Module 01	Introduction to Entrepreneurship	6 hrs
Meaning and definition of entrepreneurship , Evolution and development of entrepreneurship, Motivation theories, McClelland's Need Achievement Theory , Concepts of entrepreneurship, Entrepreneur vs. entrepreneur (owner vs. innovator perspectives) , Entrepreneur vs. manager , Role of entrepreneurship in economic development , Factors affecting entrepreneurship , Problems and challenges of entrepreneurship.		
Module 02	The Entrepreneur	6 hrs
Why individuals become entrepreneurs, Types of entrepreneurs, Social entrepreneurship, Rural entrepreneurship, Family business entrepreneurship, Entrepreneurial decision-making process.		
Module 03	Women Entrepreneurship	6 hrs
Importance of women entrepreneurship, Factors encouraging women entrepreneurship, Characteristics of successful women entrepreneurs, Challenges faced by women entrepreneurs, Growth of women entrepreneurship, Achievements of women entrepreneurs, Role models in women entrepreneurship.		
Module 04	Entrepreneurial Skills and Competencies	6 hrs
Communication skills, Creativity and innovation, Problem-solving techniques, Negotiation skills, Risk management, Leadership and teamwork.		
Module 05	Business Organizations and Legal Framework	8 hrs
Forms of business organizations, Sole Proprietorship, Joint Hindu Family Business, Partnership, Limited Liability Partnership (LLP), Company (Corporate Governance), Business laws applicable to startups, Registration and legal compliance. Concept of entrepreneurial failure, Causes of entrepreneurial failure, Common business mistakes, Managing business crises, Strategies for sustainable business growth, Lessons from successful and failed entrepreneurs.		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1. Vasant Desai – Dynamics of Entrepreneurial Development and Management 2. S.S. Khanka – Entrepreneurial Development 3. Rajeev Roy – Entrepreneurship 4. Poornima Charantimath – Entrepreneurship Development and Small Business Enterprises.
Reference Book: 1. Peter F. Drucker – Innovation and Entrepreneurship 2. Robert D. Hisrich, Michael Peters & Dean Shepherd – Entrepreneurship 3. Donald Kuratko – Entrepreneurship: Theory, Process and Practice 4. Bruce R. Barringer – Entrepreneurship: Successfully Launching New Ventures 5. Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, CengageLearning, 2016. 6. Vijay Sathe, Corporate Entrepreneurship, Cambridge, 2009.



Shanti Education Society's
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OPEN ELECTIVE – I
25UGCVOE306C SUSTAINABLE INNOVATION AND GREEN TECHNOLOGIES

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Prerequisites

Students should possess basic knowledge of:

1. Environmental Studies
2. Basic Engineering Science
3. Fundamentals of Energy and Environment.

Course Objectives :

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

- CO1:** Understand the concepts, principles, and significance of sustainable innovation and green technologies.
CO2: Examine renewable energy technologies and evaluate their environmental and economic benefits.
CO3: Explore sustainable infrastructure, resource-efficient technologies, and green building concepts.
CO4: Develop knowledge of waste management, pollution control, and circular economy practices.
CO5: Analyze emerging green technologies and their applications in sustainable development.
CO6: Promote environmental responsibility and sustainable decision-making in engineering and technology.

Course Outcomes:

After completing this course, students will be able to:

- CO1:** Explain the principles and applications of sustainable innovation and green technologies.
CO2: Compare renewable energy systems based on efficiency, feasibility, and environmental impact.
CO3: Apply sustainable design principles in engineering and infrastructure development.
CO4: Evaluate waste management and pollution control techniques for environmental sustainability.
CO5: Assess emerging green technologies and recommend suitable solutions for sustainability challenges.
CO6: Analyze carbon footprints and propose strategies for achieving sustainable development goals.

Module 01	Fundamentals of Green Technology	6 hrs
Introduction, Definition, Objectives, Scope and Importance of Green Technology; Principles of Sustainability; Environmental Challenges; Sustainable Development Goals (SDGs); Role of Engineers in Environmental Protection; Green Technology Policies and Environmental Awareness.		
Module 02	Sustainable Development and Resource Management	6 hrs
Concept and Principles of Sustainable Development; Triple Bottom Line; Life Cycle Assessment (LCA); Green Indicators; Resource Conservation; Circular Economy; Energy Efficiency; Water Conservation; Carbon Footprint and Ecological Footprint.		
Module 03	Renewable Energy Technologies	6 hrs
Solar Energy (PV and Thermal); Wind Energy; Hydropower; Biomass and Biofuels; Geothermal Energy; Ocean Energy; Hydrogen Energy; Energy Storage Systems; Smart Grid Integration; Opportunities and Challenges of Renewable Energy.		
Module 04	Green Buildings and Sustainable Infrastructure	6 hrs
Concepts and Principles of Green Buildings; Sustainable Construction Materials; Passive Design Techniques; Energy-Efficient Building Systems; Water Conservation Techniques; Green Roofs and Rainwater Harvesting; Green Building Rating Systems (LEED, GRIHA, IGBC).		
Module 05	Waste Management and Pollution Control	8 hrs
Municipal Solid Waste Management; 3R Principles (Reduce, Reuse, Recycle); E-waste Management; Plastic Waste Management; Hazardous Waste; Waste-to-Energy Technologies; Air and Water Pollution Control; Sustainable Packaging; Environmental Management Systems (ISO 14001). Emerging Green Technologies and Innovations – Green Transportation, Electric and Hybrid Vehicles, Eco-labeling, Carbon Footprint and Credits, Climate Smart Agriculture, Green IT, Clean Tech Startups, Case Studies of Successful Green Projects.		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1. Green Technologies: Concepts, Methodologies, Tools and Applications, Ramesha Chandrappa & Umesh Chandra, Springer. 2. Green Technology: An Approach for Sustainable Environment, Tanuja A. Pandit, I.K. International Publishing House. 3. Introduction to Green Technology, Madhumita Bhattacharyya, Oxford University Press.
Reference Book: 1. Sustainable Engineering: Concepts, Design and Case Studies, David T. Allen & David R. Shonnard. 2. Environmental Science and Technology, Stanley E. Manahan. 3. Renewable Energy Resources, John Twidell & Tony Weir. 4. Green Chemistry and Engineering: A Pathway to Sustainability, Anne E. Marteel-Parrish & Martin A. Abraham. 5. Renewable and Efficient Electric Power Systems, Gilbert M. Masters.
Open Learning Recourses: 1. National Programme on Technology Enhanced Learning Website: https://nptel.ac.in



Shanti Education Society's
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OPEN ELECTIVE – I

25UGCVOE306D SUSTAINABLE WASTE MANAGEMENT AND CIRCULAR ECONOMY

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Course Prerequisites

Students should possess basic knowledge of:

1. Basic Environmental Science
2. Fundamentals of Engineering Materials (Desirable)

Course Objectives :

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

- CO1:** To introduce the concepts of sustainable waste management and circular economy.
- CO2:** To understand different types of waste and their environmental, economic, and social impacts.
- CO3:** To study waste collection, segregation, recycling, recovery, and treatment technologies.
- CO4:** To familiarize students with resource recovery, waste valorization, and circular economy practices.
- CO5:** To understand environmental policies, regulations, Extended Producer Responsibility (EPR), and sustainable waste governance.
- CO6:** To develop engineering solutions for resource conservation and sustainable waste management.

Course Outcomes:

After completing this course, students will be able to:

- CO1:** Explain the concepts of sustainable waste management, circular economy, and resource conservation.
- CO2:** Classify different waste streams and evaluate their environmental and health impacts.
- CO3:** Apply waste segregation, collection, recycling, and recovery techniques for sustainable waste management.
- CO4:** Analyze modern waste treatment technologies and material recovery systems.
- CO5:** Evaluate waste management regulations, EPR policies, and circular economy practices.
- CO6:** Recommend sustainable engineering solutions for waste minimization through case studies and real-world applications.

Module 01	Introduction to Sustainable Waste Management	6 hrs
Concepts of Waste and Circular Economy, Sources and Classification of Waste (Municipal, Industrial, Biomedical, Plastic, Construction & Demolition, Electronic Waste), Waste Generation Trends, Sustainable Development Goals (SDGs), Environmental Challenges.		
Module 02	Environmental and Health Impacts of Waste	6 hrs
Hazardous Waste Characteristics, Heavy Metals and Toxic Chemicals, Air, Water and Soil Pollution, Micro plastics, Greenhouse Gas Emissions from Waste, Human Health Risks, Environmental Risk Assessment.		
Module 03	Waste Collection and Resource Recovery	6 hrs
Waste Segregation at Source, Collection and Transportation Systems, Material Recovery Facilities (MRFs), Recycling Processes, Composting, Biomethanation, Reverse Logistics, Urban Mining, Occupational Safety in Waste Management.		
Module 04	Waste Treatment Technologies	7 hrs
Mechanical, Biological and Thermal Treatment, Waste-to-Energy Technologies, Incineration, Pyrolysis, Gasification, Anaerobic Digestion, Landfill Management, Resource Recovery and Circular Manufacturing Practices.		
Module 05	Environmental Policies and Circular Economy	7 hrs
Solid Waste Management Rules, Plastic Waste Management Rules, E-Waste Management Rules, Biomedical Waste Rules, Extended Producer Responsibility (EPR), Green Procurement, Eco-design, Life Cycle Assessment (LCA), Environmental Management Systems (ISO 14001) Smart Waste Management using IoT and AI, Digital Waste Tracking, Sustainable Packaging, Green Entrepreneurship, Circular Business Models, Best Practices in India and Abroad, Campus Waste Management, Future Opportunities in Circular Economy.		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books:
1) Tchobanoglous, G., Integrated Solid Waste Management, McGraw-Hill.
2) Ramesha Chandrappa, Sustainable Solid Waste Management, Springer.
3) David T. Allen and David R. Shonnard, Sustainable Engineering: Concepts, Design and Case Studies.
Reference Book:
1) Stanley E. Manahan, Environmental Science and Technology.
2) Paul T. Anastas and Julie B. Zimmerman, Green Engineering: Principles and Practice.
3) Walter R. Stahel, The Circular Economy: A User's Guide.
4) Ellen MacArthur Foundation Reports on Circular Economy.
5) CPHEEO Manual on Municipal Solid Waste Management.



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OPEN ELECTIVE – I
25UGCVOE306E DATA ANALYTICS USING ADVANCED SPREADSHEETS

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Prerequisites

Students should possess basic knowledge of:

1. Basic knowledge of spreadsheet software (Microsoft Excel or equivalent).
2. Familiarity with basic formulas, functions, and worksheet operations.

Course Objectives :

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

- CO1:** Understand the interface, features, and advanced functionalities of spreadsheet software for efficient data organization and management.
- CO2:** Apply logical, text, statistical, date, and time functions to solve real-world data analysis problems.
- CO3:** Utilize data validation techniques to ensure data accuracy, consistency, and integrity.
- CO4:** Create meaningful charts, PivotTables, and Pivot Charts for effective data visualization and decision-making.
- CO5:** Automate repetitive tasks using macros to improve productivity and workflow efficiency.

Course Outcomes:

After completing this course, students will be able to:

- CO1:** Demonstrate proficiency in spreadsheet operations, including worksheet management, formatting, and data organization.
- CO2:** Apply logical and text functions to process and analyze datasets effectively.
- CO3:** Use date, time, and statistical functions for data manipulation and business analysis.
- CO4:** Implement data validation techniques to improve data quality and minimize errors.
- CO5:** Develop interactive reports and dashboards using charts, PivotTables, and Pivot Charts.
- CO6:** Record, edit, and execute macros to automate repetitive tasks and enhance operational efficiency.

Module 01	Introduction to Advanced Spreadsheets	6 hrs
Spreadsheet interface, worksheet management, cell and range operations, formatting, conditional formatting, data organization		
Module 02	Logical and Text Functions	6 hrs
AND, OR, NOT, IF, TRUE, FALSE, SEARCH, FIND, LEFT, RIGHT, MID, LEN, EXACT, SUBSTITUTE, REPLACE		
Module 03	Date, Time and Statistical Functions	6 hrs
DATE, TODAY, NOW, WEEKDAY, NETWORKDAYS, EDATE, EOMONTH, HOUR, MINUTE, AVERAGEIF, COUNTIF, SUMIF		
Module 04	Data Validation Techniques	6 hrs
Number, date, time, text validation, custom validation, list validation		
Module 05	Data Visualization and Reporting	6 hrs
Charts, PivotTables, Pivot Charts, Combo Charts, Data Analysis Reports Introduction to VBA macros, recording, editing, running macros, assigning macros to buttons and menus		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1. Mastering Advanced Excel- Ritu Arora 2. Advanced Excel Success: A Practical Guide to Mastering Excel by Alan Murray 3. Advanced Excel for Productivity by Chris Urban.
Reference Book: 1. Excel 2019 Bible, Michael Alexander, Publisher: Wiley, 1st edition 2. Excel 2019 All-in-One For Dummies, Greg Harvey, Publisher: For Dummies, 1st edition. Open-Source Learning Resources: 1. Microsoft Learn: Official free training by Microsoft on Excel advanced features 2. learn.microsoft.com/excel 3. https://rituarora.in/advance-excel/ 4. https://support.microsoft.com/en-us/excel 5. https://edu.gcglobal.org/en/excel



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

OPEN ELECTIVE – I
25UGCVOE306F ENGINEERING MANAGEMENT AND PROFESSIONAL PRACTICES

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Prerequisites

Students should possess basic knowledge of:

1. Basic communication and comprehension skills.
2. Fundamental analytical and problem-solving abilities

Course Objectives :

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

- CO1:** Develop a comprehensive understanding of management principles, functions, and practices applicable to engineering organizations.
- CO2:** Understand organizational structures, managerial roles, and decision-making processes within modern industries and corporate environments.
- CO3:** Analyze the significance of corporate governance, business ethics, and strategic management in achieving organizational excellence.
- CO4:** Enhance leadership, communication, teamwork, and interpersonal skills required for effective professional practice.
- CO5:** Apply basic concepts of financial, operational, and human resource management to solve engineering and managerial problems.
- CO6:** Integrate theoretical knowledge with practical applications through industrial case studies and problem-solving exercises.

Course Outcomes:

After completing this course, students will be able to:

- CO1:** Explain the fundamental principles and functions of engineering management.
- CO2:** Describe organizational structures and management processes in industrial and corporate organizations.
- CO3:** Evaluate managerial decisions considering ethical, strategic, and governance perspectives.
- CO4:** Demonstrate knowledge of human resource, financial, and operations management concepts.
- CO5:** Apply leadership, communication, and teamwork skills in professional environments.
- CO6:** Analyze real-world engineering management problems using appropriate management tools and case studies.

Module 01	Introduction to Engineering Management	6 hrs
Definition, nature, scope, importance of management, evolution of management thought, managerial functions, managerial roles, and responsibilities of engineers.		
Module 02	Organizational Structure and Corporate Environment	6 hrs
Types of organizational structures, organizational design principles, matrix organization, project-based organizations, organizational culture, industrial case studies, organizational success and failure.		
Module 03	Strategic Management and Business Planning	6 hrs
Vision, mission, objectives, strategic planning process, SWOT analysis, PESTLE analysis, strategic decision-making, introduction to competitive strategy.		
Module 04	Human Resource Management and Leadership	6 hrs
HR functions, recruitment, training and development, performance appraisal, leadership theories, team building, conflict management, negotiation skills, workplace communication.		
Module 05	Financial and Operations Management	8 hrs
Financial terminology, budgeting, cost estimation, project planning, quality management principles, operations management, introduction to Lean, Six Sigma, and Total Quality Management (TQM). Innovation management, entrepreneurship, corporate governance, business ethics, sustainability, environmental responsibility, Corporate Social Responsibility (CSR), emerging management practices.		

Internal Continuous Assessment

One Assignment on each unit

References:

Text Books:

1. Harold Koontz & Heinz Weihrich – Essentials of Management
2. Stephen P. Robbins & Mary Coulter – Management
3. Prasad L.M. – Principles and Practices of Management

Reference Book:

1. Peter F. Drucker – The Practice of Management
2. Harvard Business Review – Selected Articles on Management
3. Richard L. Daft – Management
4. P.C. Tripathi & P.N. Reddy – Principles of Management

Open Educational Resources:

1. NPTEL Courses on Engineering Management
2. SWAYAM MOOCs
3. IIT Virtual Labs
4. Harvard Business Review (Selected Articles)



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVIE307 ENTREPRENEURSHIP AND BUSINESS INNOVATION

Teaching Scheme		Examination Scheme	
Lectures	0 Hours/ week	ISE	25
Tutorial	0 Hours / week	MSE	00
Practical	2 Hours / week	ESE	00
Credits	1		

Course Prerequisite :

This course requires familiarity with basic business terminology, management principles and economics.

Course Objectives :

After completing this course, the student will be able to:

- CO1:** Introduce students to the principles of innovation, entrepreneurship, and intrapreneurship within the civil engineering domain.
- CO2:** Cultivate creative problem solving through design thinking and ideation techniques.
- CO3:** Develop student capabilities in business model creation and lean startup strategies for infrastructure-based ventures.
- CO4:** Familiarize students with the Indian startup ecosystem, funding options, legal aspects, and intellectual property.
- CO5:** Inspire entrepreneurial thinking through real-world case studies and collaborative projects focused on civil engineering challenges.

Course Outcomes:

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

- CO1:** Explain the role of innovation and entrepreneurship in addressing challenges within civil and infrastructure sectors.
- CO2:** Apply design thinking to identify and validate problems in the built environment.
- CO3:** Develop and present a viable business model using the Business Model Canvas (BMC).
- CO4:** Analyze incubation mechanisms, funding strategies, and legal structures for startups.
- CO5:** Evaluate successful civil engineering startups and propose innovative, sustainable solutions.
- CO6:** Demonstrate entrepreneurial communication skills through ideation pitching and stakeholder engagement.

Practical Course: Innovation and Entrepreneurship in Civil Engineering

Practical No.	Title of Practical	Module	Hours
1	Civil Engineering Problem Identification and Opportunity Mapping	I	2
2	Innovation Opportunity Assessment in Civil Engineering	I	2
3	Design Thinking for Civil Engineering Problem Solving	II	2
4	Creative Ideation Using SCAMPER and Mind Mapping	II	2
5	Development of a Minimum Viable Product (MVP)	II	2
6	Civil Engineering Startup Case Study and Business Model Analysis	III	2
7	Startup Failure Analysis and Lessons Learned	III	2
8	Preparation of Business Model Canvas (BMC)	III	2
9	Startup Ecosystem and Incubation Support Mapping	IV	2
10	Funding Strategy for a Civil Engineering Startup	IV	2
11	Legal, Business Entity and IPR Identification Exercise	IV	2
12	Preparation and Presentation of Startup Pitch Deck	IV	2
13	Market and Customer Analysis for a Startup Idea	V	2
14	Preparation of Operational and Human Resource Plan	V	2
15	Working Capital and Break-Even Analysis	V	2
16	Preparation and Presentation of Complete Business Plan	V	2

References:

Text Books:

- 1) Dr. Vasanthakumar- Innovation and Entrepreneurship, Wiley . Fourth edition
- 2) S.S. Khanka- Entrepreneurship Development, S. Chand Publishing. Fifth edition
- 3) Alexander Osterwalder & Yves Pigneur- Business Model Generation, Wiley. Textbooks: First edition

Reference Book:

- 1) Arya Kumar- Entrepreneurship: Theory, Process, Practice, Pearson Education India.
- 2) Vasant Desai- Dynamics of Entrepreneurship Development, Himalaya Publishing House.
- 3) P.C. Mohapatra- Project Management: A Managerial Approach, PHI Learning.
- 4) P.K. Goel- Legal Aspects of Business, Pearson Education India.



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVVE308 UNIVERSAL HUMAN VALUES

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	25
Tutorial	0 Hours / week	MSE	00
Practical	0 Hours / week	ESE	00
Credits	2		

Course Prerequisite :

Engineering Mathematics, Engineering Mechanics, Basic Civil Engineering, Engineering Surveying, Geotechnical Engineering, and Construction Materials.

Course Objectives :

The learning objectives of this course are

- CO1:** To help learners appreciate the essential complementarity between human values and professional skills
- CO2:** To facilitate learners the development of a holistic perspective towards life and profession.
- CO3:** To highlight the importance of human relationships to the learners' and the role of ethical competence in personal and professional contexts.
- CO4:** To encourage learners to apply human values in their daily professional and personal lives.

Course Outcomes:

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

- CO1:** Appreciate the need for human values in personal and professional life.
- CO2:** Develop ethical competence and commitment.
- CO3:** Understand the importance of harmony in human relationships and society.
- CO4:** 4. Reflect on values for sustainable and fulfilling living.

Module 01	Introduction to Value Education	4 hrs
Purpose and motivation for value education. Content and process of value education. Distinction between values and skills. Understanding happiness and prosperity correctly. Need and basic guidelines for value education		
Module 02	Harmony in the Human Being	5 hrs
Understanding human being as co-existence of self and body. Harmony of self with body – Sanyam and Swasthya. Program to ensure Sanyam and Swasthya		
Module 03	Harmony in the Family and Society	5 hrs
Harmony in the family – understanding values in relationships. Trust and Respect as foundational values. The comprehensive human goal: Samadhan, Samridhi, Abhay, Sah-astitva. Harmony in society – universal human order		
Module 04	Harmony in Nature and Existence	5 hrs
Understanding harmony in nature and existence. Interconnectedness and mutual fulfillment among the four orders of nature. Holistic perception of harmony		
Module 05	Implications of Holistic Understanding	5 hrs
Natural acceptance of human values. Transition from current state to holistic way of living. Implications on profession, society, and nature. Competence in professional ethics Implications of the Holistic Understanding – a Look at Professional Ethics A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order Competence in Professional Ethics. Holistic Technologies, Production Systems and Management Models- Typical Case Studies. Strategies for Transition towards Value-based Life and Profession		

References: Textbooks: A Foundation Course in Human Values and Professional Ethics by R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi. Reference books: 1. “Human Values” by A. N. Tripathi, New Age International Publishers. 2. “Essentials of Ethics for Engineers” by Martin Mike, Schinzinger Roland. (e.g., “Leading with Emotional Intelligence”, “Building High-Performance Teams”) Open Source Learning Resources 1. AICTE UHV Modules – Value Education overview videos and slides 2. NPTEL: Self & Body – Human being and health 3. YouTube: Dr. R.R. Gaur Lectures – Human relationships 4. UNESCO Sustainable Education Portal 5. Ethics in Engineering – MIT OCW . 6. LinkedIn Learning – Leadership & Teamwork Courses



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVPC309L CONCRETE TECHNOLOGY LABORATORY

Teaching Scheme		Examination Scheme	
Lectures	0 Hours/ week	ISE	30
Tutorial	0 Hours / week	MSE	00
Practical	2 Hours / week	ESE	20
Credits	1		

Course Prerequisite :

Engineering Mathematics, Engineering Mechanics, Basic Civil Engineering, Engineering Surveying, Geotechnical Engineering, and Construction Materials.

Course Objectives :

After completing this course, the student will be able to:

- CO1:** Conduct laboratory tests on soils, aggregates, and bituminous materials
- CO2:** Interpret results for pavement applications.

Course Outcomes:

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

- CO1:** Perform tests on various road construction materials.
- CO2:** Perform CBR tests on local soils to determine subgrade properties needed for roadways.

Course Content

Term work shall consist of performing minimum five experimental sets from the list below.

1. Testing of Cement:

- | |
|---|
| <ul style="list-style-type: none">• Consistency, Fineness, Setting Time, Specific Gravity,• Soundness and Strength Test for Cement |
|---|

2. Testing of Aggregates:

- | |
|--|
| <ul style="list-style-type: none">• Specific Gravity, Sieve Analysis, Bulking of Fine Aggregate,• Flakiness Index, Elongation Index and Percentage Elongation |
|--|

3. Workability Tests:

- | |
|--|
| <ul style="list-style-type: none">• Slump, Compaction, |
|--|

4. Strength Tests on Concrete:

- | |
|---|
| <ul style="list-style-type: none">• Compression, Flexure, Split & Tensile Test, |
|---|

5. Effects of Admixture:

- | |
|---|
| <ul style="list-style-type: none">• Accelerator, Retarder, Super Plasticizer, |
|---|

6. Exercise and verification of Concrete Mix Design,

7. Non-destructive Testing for Concrete.

Internal Continuous Assessment

detailed reporting in form of journal and Project Reports should be submitted on each conducted Lab

References:

IRC: 58–2011

IRC: 37–2012



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

26UGCVPC310L BUILDING PLANNING CONSTRUCTION AND DRAWING LABORATORY

Teaching Scheme		Examination Scheme	
Lectures	0 Hours/ week	ISE	30
Tutorial	0 Hours / week	MSE	00
Practical	2 Hours / week	ESE	20
Credits	1		

Course Prerequisite : Building Construction

Course Objectives :

After completing this course, the student will be able to:

- CO1:** To Develop students' proficiency in using CAD for designing building components.
- CO2:** To Equip students to plan and design residential buildings using CADD tools.
- CO3:** To Ensure students are capable of designing in compliance with relevant building bylaws.

Course Outcomes:

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

- CO1:** Plan and design a G+1 residential building using CADD tools.
- CO2:** Enlist various utility requirements in building plans.
- CO3:** Develop plans for residential buildings in accordance with current building bylaws.

Term work shall consist of detailed report of in form of Imperial size sheets / CAD Printouts set of drawings mentioned below.

Course Content:

Unit No.	Description	
A)	Planning & design of a building (Minimum G+1): Full set of drawings of Detached / Semi detached/ Row house / Apartment for: 1. Municipal Submission drawing as per local statutory body bye-laws such as Town Planning, Municipal Council or Corporation Authorities. 2. Furniture layout plan	
B)	3. Electrification plan. 4. Water supply & drainage plan. 5. Foundation / Center Line Drawing 6. Project report giving details of Drainage System, Water Supply System, Water Tank, Septic Tank Design of terrace Drainage System. 7. Setting out of planned building actually on ground using conventional or modern surveying instruments Imperial size sheets/ CAD Printouts based on actual measurement of existing residential building consisting of plan, elevation, section passing through staircase, Site plan. Area statement & brief specifications.	

Textbooks:

1. M.G. Shah, C.M. Kale, S.Y. Patki, *Building Drawing*, Tata McGraw Hill Education, Revised Edition, 2018
2. S.C. Rangwala, *Building Construction and Drawing*, Charotar Publishing House, 7th Edition, 2020
3. S.S. Bhavikatti, *Building Planning and Drawing*, IK International Publishing House, 4th Edition, 2021

Reference books

1. S.P. Arora, S.P. Bindra, *A Textbook of Building Construction: Drawing and Design*, Dhanpat Rai Publishing, Latest Reprint, 2022
2. W.B. McKay, *Building Construction Volume 1–4 (Includes Drawing Details)*, Pearson Education, Reprint Edition, 2013
3. R. Chudley, R. Greeno, *Building Construction Handbook*, Routledge (Taylor & Francis), 12th Edition, 2020
4. Bindra, Arora, *Building Drawing and Design*, Dhanpat Rai Publishing, Latest Edition, 2021



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVVS311 CIVIL ENGINEERING SOFTWARE (AUTO CAD)

Teaching Scheme		Examination Scheme	
Lectures	00	ISE	25
Tutorial	00	MSE	00
Practical	2 Hours / week	ESE	00
Credits	1		

Course Prerequisite :

Basic Civil Engineering, Engineering Graphics, Building planning and drawing.

Course Objectives :

The objective of this course are :

- CO1:** To introduce the fundamentals of computer aided drafting.
- CO2:** To familiarize students with 2D and basic 3D drawing tools in AutoCAD.
- CO3:** To develop engineering drawings such as building plans, section and elevations.
- CO4:** To promote understanding of drafting standards and layer management.

Course Outcomes:

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

- CO1:** Identify and use essential AutoCAD tools and commands.
- CO2:** Draw 2D objects such as lines, circle, polygons, and hatching.
- CO3:** Develop civil engineering drawings such as building plans, section and elevations.
- CO4:** Apply layers, dimensions, and annotation tools effectively.
- CO5:** Export, print and manage drawing files in standard formats.

Course Content		
Module 01	Introduction to AutoCAD Interface, Units, Limits.	6hrs
• Launch software, set limits, use line and circle. • Basic drawing tools. • Line types and line weights. • Create layers and assign properties.		
Module 02	Object Snaps, Grid, Ortho, Polar Tracking	4hrs
1. Use Precision tools to draw layouts. 2. Hatching and Pattern filling. 3. Text and Dimensions.		
Module 03	Creating Building Plan (2BHK/1BHK)	4hrs
1. Wall, Window, Doors. 2. Basic Plan 2D drawing.. 3. Complete Building Plane with Staircase, etc.. 4. Elevation, Section and cross section for building and other civil construction works.		
Module 04	Submission Drawing and RCC, Structural steel drawing	4hrs
1. Submission drawing for G+1 storey RCC Building. 2. RCC Structural drawing. 3. Structural steel drawing 4. Theodolite traversing- closing error distribution, Gales traverse table, omitted measurements.		
Module 05	Practice, Printing and 3D Objects	4hrs
1. Practice for drawing (2D). 2. Printing of drawings (pdf/dwg) 3. 3 D objects drawing.		

Reference Book:

1. Sham Tickoo – AutoCAD 2024 for Engineering & Designers, 3D –Advance
2. Nighat Yasmin – Introduction to AutoCAD 2025 for Civil Engineering Applications.
3. Autodesk AutoCAD User Manual

	<i>Shanti Education Society's</i> A. G. Patil Institute of Technology, Solapur An Autonomous Institute Second Year B.Tech. (Civil Engineering), Semester-III		
26UGCVFP312 Community-Based Civil Engineering Project (UBA)			
Teaching Scheme		Teaching Scheme	
Lectures	00	ISE	25
Tutorial	00	MSE	00
Practical	2 Hours / week	ESE	00
Credits	1		
Course Prerequisite : Engineering Graphics, Basic Civil Engineering, Engineering Mechanics, Environmental Studies, fundamental surveying concepts, communication skills, and computer applications. No prior knowledge of advanced Civil Engineering design courses is required.			
Course Objectives : The objective of this course are CO1: Develop Project Management Skills. CO2: Foster Interdisciplinary Collaboration CO3: Enhance Communication Skills			
Course Outcomes: At the end of the course the students will be able to CO1: Identify and Analyze Community Problems CO2: Propose Sustainable Engineering Solutions CO3: Plan and Execute Community Projects CO4: Engage with Stakeholders CO5: Document and Present Project Findings CO6: Reflect on Ethical and Social Impact			

Module 01	Orientation, Community Engagement and Problem Identification	6hrs
1. Introduction to community engagement, social responsibility, and the role of civil engineers in sustainable development. 2. Overview of project scope, objectives, expected outcomes, and assessment methodology. 3. Training on community needs assessment techniques including surveys, interviews, focus group discussions, and field observations. 4. Field visits to rural and urban communities for data collection and stakeholder interaction. 5. Identification, prioritization, and definition of community problems using field data. 6. Formation of student teams and allocation of project responsibilities.		
Module 02	Problem Analysis and Solution Concept Development	4hrs
1. Detailed analysis of the selected problem considering social, environmental, economic, and technical aspects. 2. Review of relevant literature, engineering standards, and case studies. 3. Refinement of the problem statement through community feedback. 4. Brainstorming and application of design thinking to generate alternative solutions. 5. Preliminary feasibility analysis based on cost, materials, sustainability, and site suitability. 6. Preparation and presentation of conceptual designs for feedback from faculty and community stakeholders.		
Module 03	Engineering Design and Project Planning	4hrs
1. Refinement and selection of the most suitable engineering solution. 2. Preparation of detailed engineering designs, calculations, and technical drawings. 3. Development of project implementation plans including timelines, Gantt charts, and resource allocation. 4. Preparation of cost estimates, Bill of Materials (BOM), and specifications. 5. Integration of sustainability principles and risk assessment into the project plan. 6. Finalization of engineering documentation.		
Module 04	Implementation Strategy and Project Monitoring	4hrs
1. Development of a pilot model or prototype wherever applicable. 2. Planning for field implementation and coordination with local authorities, NGOs, and community organizations. 3. Monitoring project activities through systematic data collection and evaluation methods. 4. Addressing implementation challenges using iterative problem-solving approaches. 5. Recording project progress, field observations, and necessary modifications. 6. Assessment of project outcomes and community impact.		
Module 05	Project Reporting, Presentation and Reflection	4hrs
1. Preparation of the final project report including executive summary, methodology, engineering design, implementation plan, results, impact assessment, sustainability analysis, challenges, and future scope. 2. Compilation of supporting documents such as drawings, survey data, photographs, and appendices. 3. Presentation and demonstration of project outcomes before faculty members, peers, and community stakeholders. 4. Preparation of reflective reports documenting individual learning and professional development. 5. Submission of complete project documentation for institutional records and possible publication.		

For successful completion and submission of the project, each student must complete at least one of the following community-based projects and submit a detailed project report.

Sr. No.	Project
1	Rainwater harvesting
2	Greywater reuse
3	Village drainage improvement
4	Solid waste management
5	IoT indoor air-quality monitoring
6	Solar street lighting
7	School water audit
8	Barrier-free building
9	Village road improvement
10	Community composting

Autonomous Curriculum Syllabus
Second Year B.Tech. in Civil Engineering (Sem- IV)
Effective from A.Y. 2026-27



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVPC401 STRUCTURAL MECHANICS -I

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ISE	20
Tutorial	1 Hours / week	MSE	20
Practical	00	ESE	60
Credits	3		

Course Prerequisite:

Mechanics of solids, Mathematics

Course Objectives :

After completing this course, the student will be able to:

CO1: To learn various methods to estimate deflection of beams

CO2: To learn Energy methods to solve structural system.

CO3: To learn Compatibility methods to solve indeterminate structures

CO4: To learn Determination of Continuous and end support moments of indeterminate beams and frames

CO5: To learn slope deflection method for analysis of structures

Course Outcomes:

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

CO1: Describe the concept of structural analysis, degree of indeterminacy.

CO2: Calculate slopes and deflection at various locations for different types of beams.

CO3: Identify determinate and indeterminate trusses and calculate forces in the members of trusses.

CO4: Perform the distribution of the moments the in continuous beam and frame.

CO5: Calculate the deformations in frames.

Module 01	Beam Deflections	7hrs
Calculations of deflection for determinate beams by double integration, Macaulay's method, moment area method, conjugate beam method, deflection by method of superposition		
Module 02	Energy Principles	7hrs
Strain energy and strain energy density, strain energy in traction, shear, flexure and torsion – Castiglano's and Engesser's energy theorems, principle of virtual work, application of energy theorems for computing deflections in beams, Maxwell's reciprocal theorem, Williot Mohr diagrams Thin Cylinders-Thin cylinders subjected to internal fluid pressure, wire wound thin cylinders, thin cylindrical shells, circumferential and hoop stresses, longitudinal stresses, maximum shear stress, concept of stresses in thick cylinders		
Module 03	Method of Consistent Deformation	7hrs
Different structural systems, concept of analysis, basic assumptions, indeterminacy, choice of unknowns. 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. Analysis of continuous beams propped cantilevers, continuous beams - theorem of three moments -		
Module 04	Moment Distribution Method	7hrs
analysis of continuous beams settlement effects, thermal effect, Shear Force and Bending Moment diagrams for continuous beams, portal frames with and without sway.		
Module 05	Slope Deflection Method	7hrs
Analysis of continuous beams, analysis of rigid frames, frames without sway and with sway, settlement effects, introduction to difficulties in frames with sloping legs and gabled frames		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 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", 4. Khurmi R.S., "Theory of Structures", S Chand, Delhi 5. Punmia B.C., "Structural Analysis", Laxmi Publications
Reference Book: 1. Timoshenko and Young, "Theory of structures", McGraw Hill 2. Norris C. H. and Wilbur J. B., "Elementary Structural Analysis", McGraw Hill 21 3. Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH 4. Hibbler R. C., "Structural Analysis", Pearson Publications, 9th Edition 5. Schodek, "Structures", Pearson Education, 7th edition 6. Ramamrutham S. and Narayanan R., "Theory of Structures" Dhanpat Rai Publishers, Delhi
e-Resources
https://onlinecourses.nptel.ac.in/noc23_me140/preview



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute

Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVPC402 HYDRAULICS ENGINEERING

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ISE	20
Tutorial	1 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisite :

Basic Physics, Basic Engineering Mechanics, Basic Mathematics

Course Objectives :

After completing this course, the student will be able to:

- CO1:** To impart foundational knowledge of fluid properties, pressure concepts, and hydrostatics as applied to engineering problems.
- CO2:** To develop analytical skills in solving problems related to fluid kinematics and dynamics using fundamental fluid flow equations.
- CO3:** To enhance understanding of flow characteristics in closed conduits and open channels, including laminar, turbulent, uniform, and non-uniform flow conditions.
- CO4:** To introduce concepts of dimensional analysis and model studies for the design and analysis of hydraulic structures and systems.
- CO5:** To enable students to apply principles of hydraulics to the design and evaluation of pipelines, pumps, turbines, and open-channel flow systems.

Course Outcomes:

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

- CO1:** Demonstrate an understanding of fluid properties and measurement techniques, and apply them to analyze static and dynamic behavior of fluids in civil engineering contexts.
- CO2:** Interpret and model fluid kinematics to propose effective engineering solutions in domains such as hydrology, irrigation, and transportation systems.
- CO3:** Utilize fluid dynamic principles to evaluate forces and pressures acting in engineering systems, fostering analytical problem solving in structural and environmental applications.
- CO4:** Measure flow through orifices and mouthpieces using practical experiments, and estimate energy losses to enhance operational efficiency.
- CO5:** Design and analyze closed conduit systems and pipe networks, integrating theoretical knowledge with practical design tools to ensure effective water distribution.

Module 01	Fluid Properties	8hrs
Definition of Fluid, Scope and Importance of Fluid Mechanics, Physical properties of fluids: density, specific weight, specific volume, relative density and viscosity, Newtonian and Non Newtonian fluids, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure, Cavitations. Classification of fluids. Problems involving the use of the above Fluid Properties.		
Module 02	Fluid Statics	6hrs
PASCAL's law, Units and scale of pressure measurement. Atmospheric pressure, Absolute pressure, Gauge pressure, and Vacuum pressure. Piezometer. U-Tube manometer, Single column manometer, U tube differential manometer, Inverted U-tube differential manometer, Mechanical pressure gauges. Total pressure and center of pressure, pressure diagram, Total pressure on plane surfaces and curved surfaces, depth of center of pressure. Buoyant force, Buoyancy, and Center of Buoyancy. Metacenter and Metacentric height, Equilibrium of floating and submerged bodies, Metacentric height evaluation.		
Module 03	Fluid Kinematics & Fluid Dynamics	6hrs
Types of fluid flow: Steady and unsteady flow, Uniform and non-uniform flow, Laminar & turbulent flow, Rotational & irrotational flow, Compressible & Incompressible flow, Rotational & Irrotational flow, Subcritical, critical & Supercritical flow, One, Two & and Three-dimensional flow. Rate of flow, Continuity Equation. Velocity potential and stream function, Equipotential Line. Flow net, uses, and limitations of a flow net. Forces acting on a fluid mass in motion, Euler's equation of motion along a streamline. Bernoulli's Theorem, Limitation, and Applications. Measurement of discharge through Venturi meter, Orifice meter, Measurement of velocity through Pitot tube.		
Module 04	Flow Through Pipes	6hrs
Energy Losses in pipe flow (Major and Minor Losses): Darcy-Weisbach Equation, Factors affecting friction, Concept of Equivalent length and Equivalent diameter of pipe, Pipes in Series and Parallel. Concept of HGL and TEL Concept of Syphon, water hammer and surge tank, its function and location and use.		
Module 05	Hydraulic Turbines and Pumps	6hrs
Turbines Hydro-electric power plant, Definition of Heads and Efficiencies of turbin, Classification of hydraulic turbines Pump Classification of Pumps, Types and Head of Efficiencies		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1) A Textbook of Fluid Mechanics and Hydraulic Machines, Dr. R. K. Bansal, Laxmi Publications, 3rd Edition. 2) Fluid Mechanics and Hydraulic Machines, Dr. D. S. Kumar, S. K. Kataria & Sons, 10th Revised Edition. 3) Hydraulic Engineering, John A. Roberson, Clayton T. Crowe, and Fredrick A. Chilton, Wiley Publication, 2nd Edition
Reference Book: 1) Fluid Mechanics - V. L. Streeter and E. B. Wile- McGraw-Hill International Book Co... Auckland. 2) Elementary Fluid Mechanics - H. Rouse-Toppan C. Ltd., Tokyo. 3) Fluid Mechanics - Shames - McGraw-Hill International Book Co. 4) Fluid Mechanics-Munson, Young- Wiley India. 5) Mechanics of Fluids- M.C. Potter. Wiggert, Ramadan-Cengage Le
e-Resources
NPTEL/SWAYAM (Fluid Mechanics/Hydraulics)



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVPC403 SURVEYING

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Course Prerequisite :

Basic Physics, Basic Chemistry, Basic Mathematics

Course Objectives :

After completing this course, the student will be able to:

- CO1:** To determine the relative position of any objects or points of the Earth
- CO2:** To determine the distance and angle between different objects.
- CO3:** To prepare a map or plan to represent an area on a horizontal plan.
- CO4:** To work as a team member on a surveying project to achieve a common goal..

Course Outcomes:

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

- CO1:** Perform measurements in linear/angular methods.
- CO2:** Perform plane table surveying in general terrain.
- CO3:** Know the basics of leveling and theodolite survey in elevation and angular measurement.
- CO4:** Perform work as a team member on a surveying project to compile all surveying data to prepare a project map.

Module 01	Chain Surveying	6hrs
Definitions for surveying, Principles of surveying, Classifications of surveying, field and office work, Conventional signs, surveying instruments their care and adjustments. Ranging, chaining, reciprocal ranging, setting perpendiculars, well conditioned triangles, traversing. Plotting enlarging and reducing figures.		
Module 02	Compass and Plane Table Surveying	6hrs
Prismatic compass, surveyor's compass. Bearing system and conversions. Local attraction , magnetic declination. Dip, traversing, adjustment of error. Plane table instrument and accessories. Merits demerits of plane tabling. Method of plane tabling- Radiation, Intersection, Resection, Traversing.		
Module 03	Leveling and Applications	8hrs
Level line, horizontal line, levels and staves. Sensitiveness, bench marks, temporary and permanent adjustments. System of leveling, types of leveling and plotting. Contouring methods, Characteristics and use of contours and plotting. Earth work volume, capacity of reservoirs, Planimeter, types, theory, concept of zero circle. Study of digital planimeter. Computation of area and volumes.		
Module 04	Theodolite Surveying , Subtense bar & GIS,GPS	6hrs
Theodolite- Vernier, micro optics, description and use. Temporary and permanent adjustment of Vernier transit. Angles – horizontal, vertical-heights and distances Theodolite traversing- closing error distribution, Gales traverse table, omitted measurements. Subtense bar for measuring horizontal Distance. Global positioning system, Geographic information Photogrammetry in GIS and GPS.		
Module 05	Engineering Surveys	6hrs
Preliminary and location surveys for engineering projects. Layouts, Laying and setting out works. Route survey for high ways, railways, water ways/canal, drainage/water supply line. Introduction to curve ranging, Mine surveying – Instruments Tunnels – correlation of underground and surface surveys, shafts.		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S. V. Kulkarni, Pune Vidyarthi Griha Prakashan. 2. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, Laxmi Publications. 3. Plane Surveying & Higher Surveying by Dr A. M. Chandra, New age international publishers New Delhi 4. Kanetkar T.P. and Kulkarni S.V. “Surveying and Levelling – Part2”, Pune Vidyarthi Griha Prakashan, Pune.
Reference Book: 1. Duggal S. K. “Surveying Volume II”, Tata McGraw-Hill Publishing Company Limited. 2. Subramaniam R., “Surveying & Levelling”, Oxford University Press. 3. Clark D., 1944, “Plane and Geodetic Surveying”, Vol. I & II, C.B.S. Pub. & Distri., N. Delhi, 6th edi. 4. Duggal S. K. “Surveying Volume I”, Tata McGraw-Hill Publishing Company Limited.
e-Resources
https://nptel.ac.in/courses/105102012



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVPC404 TRANSPORTATION ENGINEERING

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	2		

Course Prerequisite :

Engineering Mathematics, Engineering Mechanics, Basic Civil Engineering, Engineering Surveying, Geotechnical Engineering, and Construction Materials.

Course Objectives :

After completing this course, the student will be able to:

- CO1:** Understand the fundamental principles of transportation systems and highway engineering.
- CO2:** Apply geometric design principles for highways and intersections as per standard engineering practice.
- CO3:** Evaluate the engineering properties of highway materials and design bituminous mixes using standard laboratory methods.
- CO4:** Analyze traffic characteristics and design basic traffic control systems for safe and efficient roadway operations.
- CO5:** Design flexible and rigid pavements using IRC guidelines and understand the functional requirements of other modes of transportation.

Course Outcomes:

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

- CO1:** Explain transportation planning and highway systems.
- CO2:** Apply geometric design standards for highways.
- CO3:** Evaluate highway materials and design bituminous mixes.
- CO4:** Analyze traffic flow and design traffic control systems.
- CO5:** Design flexible and rigid pavements as per IRC guidelines.

Course Content

Module 01	Fundamentals of Transportation and Highway alignment	6hrs
Introduction to transportation systems and their socio-economic significance. Overview of various modes of transport: road, rail, air, water, and pipeline. Principles of Highway Engineering, Functional and administrative classification of roads as per Indian practice. Historical development and modern trends in road construction in India. Highway alignment: factors controlling alignment and engineering surveys (map study, reconnaissance, preliminary and final location surveys).		
Module 02	Geometric Design and Highway Construction Practices	8hrs
Cross-sectional elements carriageway, camber, shoulders, medians, right-of-way. Sight distance requirements: stopping, overtaking, intermediate, and headlight sight distance. Horizontal alignment: curves, super-elevation, transition curves, extra widening. Vertical alignment: gradients, summit and valley curves. Introduction to pavement construction techniques (flexible and rigid pavements). Construction and maintenance of highway drainage systems. Roadside development and road arboriculture.		
Module 03	Highway Materials	6hrs
Engineering properties of subgrade soil and their significance in pavement design. Laboratory tests on soil: CBR, Atterberg limits, compaction, and shear strength tests. Aggregates: desirable properties and tests for strength, hardness, toughness, soundness, durability, shape, specific gravity, and water absorption. Bituminous materials: Bitumen, Tar, and Asphalt — types, properties, grading systems, and applications. Design of bituminous paving mixes using the Marshall Stability Method. Quality control and material evaluation procedures.		
Module 04	Traffic Engineering and Road Safety	6hrs
Traffic characteristics: traffic stream parameters (speed, volume, density). Speed studies, journey time and delay studies. Traffic volume studies and origin-destination surveys. Analysis and interpretation of traffic data. Traffic control devices: signals, road markings, signs, and channelization. Design principles of traffic signals and rotary intersections. Parking studies and parking space design. Highway lighting systems and their design considerations. Road accidents: classification, causes, analysis, and preventive measures. Highway safety measures including anti-crash barriers (types and design concepts). Introduction to Intelligent Transport Systems (ITS) and smart mobility solutions.		
Module 05	Pavement Design and Other Modes of Transportation	6hrs
Fundamental principles of pavement design. Types of pavements: flexible, rigid, and composite pavements. Design of flexible pavements using Indian Roads Congress IRC: 37–2012 guidelines. Design of rigid pavements using Indian Roads Congress IRC: 58–2011 guidelines. Overview of other modes of transportation: Railways: classification and components, Airways: airport planning and basic requirements, Waterways: inland and maritime transport systems, Pipeline transportation: types and applications		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1) Khanna and Justo, “Highway Engineering”, Nemchand & Bros., Roorkee 2) Khanna S.K., “Highway Engineering”, 3) Arora N. L., “Transportation Engineering” 4) Bindra and Arora, “Highway Engineering”, Standard Publishers 5) Vazirani V.N. and Chandola S.P., “Transportation Engineering”, Vol I Khanna Publishers, N. Delhi 6) Vazirani V.N. and Chandola S.P., “Transportation Engineering”, Vol II Khanna Publishers, N. Delhi ISBN NO: N/A 7) Shahani P.B, “Road Techniques” Khanna Publishers, N. Delhi ISBN NO: 978-81-7409-197-1 8) Kadiyali L.R, “Traffic Engineering and Transport Planning”, Khanna Publishers, N. Delhi, ISBN NO:978-81-7409-220-X
Reference Book: 1) Garber, N.J. and Hoel, L.A., “Traffic and Highway Engineering”, West Publishing Company, New York 2) Jones, J.H., “Geometric Design of Modern Highways’, E & FN SPON Ltd., London. 3) Khistry, C.J., “Transportation Engineering – An Introduction’, Prentice Hall of India Ltd. 4) Agor R., “Surface Transportation (Railways and Highways)”, Khanna Publishers, N. Delhi ISBN NO: 978-81-7409-273-1



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVOE406A SUPPLY CHAIN MANAGEMENT

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ICE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisite :

Basics of Construction Technology Project Management and Planning

Course Objectives :

After completing this course, the student will be able to:

- CO1:** Introduce the concepts, principles, and importance of Supply Chain Management in construction and civil engineering projects.
- CO2:** Explain the movement of materials, equipment, information, and financial resources throughout the construction supply chain.
- CO3:** Develop an understanding of procurement systems, contract management, logistics, and inventory control in construction projects.
- CO4:** Familiarize students with planning, scheduling, risk management, sustainability, and digital technologies used in construction supply chains.
- CO5:** Understand supplier relationship management and coordination among project stakeholders for efficient project execution.
- CO6:** Apply supply chain management principles to improve project cost, quality, productivity, and timely completion.

Course Outcomes:

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

- CO1:** Explain the fundamentals and components of construction supply chain management.
- CO2:** Describe procurement procedures, contract management practices, and supplier selection methods used in construction projects.
- CO3:** Apply logistics planning, inventory management, and material handling techniques for effective construction operations.
- CO4:** Analyze construction supply chain planning, scheduling, sustainability practices, and digital technologies.
- CO5:** Evaluate risks affecting construction supply chains and recommend suitable mitigation strategies.
- CO6:** Apply supply chain management concepts to analyze case studies and improve project performance.

Module 01	Introduction to Supply Chain Management	7hrs
Introduction, objectives, scope, and significance of Supply Chain Management in civil engineering. Components of construction supply chains. Material, information, and financial flows. Characteristics of construction supply chains. Stakeholders including clients, consultants, contractors, subcontractors, suppliers, and logistics providers.		
Module 02	Procurement and Contract Management	8hrs
Procurement systems in construction. Tendering procedures. Contract types including Lump Sum, Item Rate, EPC, Turnkey, and PPP. Vendor prequalification and supplier selection. Purchase order systems. Supplier relationship management. Public and private procurement practices. Ethical and legal aspects of procurement.		
Module 03	Construction Logistics and Material Management	7hrs
Construction logistics planning. Transportation and handling of materials and equipment. Storage systems. Warehouse management. Just-in-Time (JIT) delivery. Inventory control techniques including ABC Analysis, EOQ, and FSN Analysis. Material tracking and safety practices.		
Module 04	Supply Chain Planning and Project Scheduling	8hrs
Fundamentals of supply chain planning. Demand forecasting. Resource planning. Scheduling techniques using Gantt Charts and milestone planning. Coordination between procurement, logistics, and project execution. Material requirement planning for construction projects.		
Module 05	Risk Management and Sustainable Construction Supply Chains	7hrs
Supply chain risks including delays, cost overruns, quality issues, supplier failures, and transportation disruptions. Risk assessment and mitigation strategies. Sustainable procurement. Green materials. Circular economy concepts. Waste minimization. Environmental regulations and resilience in construction supply chains.		
Module 06	Digital Supply Chains and Case Studies	8hrs
Introduction to digital tools in Supply Chain Management including ERP, BIM integration, RFID, and tracking software. Data analytics for decision-making. Collaborative platforms for multi-stakeholder environments. Indian and international case studies on smart supply chains in infrastructure and urban development.		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1. Sunil Chopra, Peter Meindl, and D. V. Kalra, <i>Supply Chain Management: Strategy, Planning, and Operation</i>, Pearson Education, 7th Edition. 2. Martin Christopher and Remko Van Hoek, <i>Logistics, Supply Chain and Operations Management: Case Study Collection</i>, Pearson Education, 3rd Edition. 3. David Simchi-Levi, Philip Kaminsky, and Edith Simchi-Levi, <i>Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies</i>, McGraw-Hill Education, 3rd Edition.
Reference Book: 1. Martin Christopher, <i>Logistics and Supply Chain Management</i>, Pearson Education, 5th Edition. 2. Donald J. Bowersox, David J. Closs, and M. Bixby Cooper, <i>Supply Chain Logistics Management</i>, McGraw-Hill Education, 5th Edition. 3. Gianpaolo Ghiani, Gilbert Laporte, and Roberto Musmanno, <i>Introduction to Logistics Systems Management</i>, Wiley, 2nd Edition.



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute

Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVOE406B DIGITAL MARKETING

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ICE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisite :

Basic knowledge of computers, web browsers, and internet applications, Familiarity with search engines, websites, email, and social media platforms, Basic communication, English writing, and presentation skills.

Course Objectives :

After completing this course, the student will be able to:

CO1:To introduce the concepts, evolution, and importance of digital marketing in modern business.

CO2:To explain digital business models, customer segmentation, targeting, and positioning strategies.

CO3:To develop practical skills in content creation, email marketing, social media marketing, and online advertising.

CO4:To familiarize students with digital marketing tools, CRM, e-commerce platforms, and web analytics.

CO5:To explore AI-enabled marketing, personal branding, freelancing opportunities, and emerging digital marketing trends.

Course Outcomes:

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

CO1:Explain the fundamentals, ecosystem, and applications of digital marketing.

CO2:Apply digital marketing mix strategies and design effective email marketing campaigns.

CO3:Plan, execute, and evaluate online advertising and social media marketing campaigns.

CO4:Develop content marketing strategies and analyze campaign performance using analytics tools.

CO5:Apply CRM and e-commerce concepts to improve customer relationship management and digital business operations.

CO6:Utilize AI-powered marketing tools, build a digital brand, and explore freelancing opportunities in digital marketing.

Module 01	Introduction to Digital Marketing	7hrs
Introduction, evolution, scope, and significance of digital marketing, Traditional marketing vs. digital marketing, Digital business models (B2B, B2C, C2C, D2C), Customer segmentation, targeting, and positioning (STP), Digital consumer behavior and customer journey, Digital marketing ecosystem, latest digital marketing trends and career opportunities.		
Module 02	Digital Marketing Mix & Email Marketing	8hrs
Digital marketing mix (Product, Price, Place, Promotion), Online marketing strategies, Email marketing concepts and benefits, Email campaign planning and execution, Building and managing subscriber lists, Email automation using tools (Mailchimp/Brevo), Introduction to affiliate marketing, referral marketing, and viral marketing.		
Module 03	Online Advertising & Social Media Marketing	7hrs
Introduction to online advertising, Search, Display, Video and Native advertising, Google Ads fundamentals (PPC, CPC, CPM, CPA), Social media platforms (Facebook, Instagram, LinkedIn, X, YouTube), Organic vs. Paid marketing, Campaign planning, Social media metrics (Reach, Impressions, CTR, Engagement Rate), Influencer and creator marketing.		
Module 04	Content Marketing & Web Analytics	8hrs
Content marketing fundamentals, Types of content (Blogs, Videos, Podcasts, Infographics, Reels), Content strategy and editorial calendar, SEO-friendly content basics, Key Performance Indicators (KPIs), Introduction to Google Analytics 4 (GA4), Measuring and optimizing digital marketing performance using analytics.		
Module 05	CRM, E-Commerce & Digital Channels	7hrs
Customer Relationship Management (CRM): Concepts, objectives, and benefits, CRM lifecycle and automation, CRM tools overview, E-commerce business models and platforms, Digital payment systems, Customer experience management, Digital supply chain and value chain, Omnichannel marketing concepts.		
Module 06	Digital Branding, Freelancing & AI in Digital Marketing	8hrs
Digital branding and personal branding, Building professional portfolios and LinkedIn profile optimization, Freelancing platforms (Fiverr, Upwork, Freelancer), Introduction to AI in digital marketing, AI-powered content generation (ChatGPT, Copy.ai, Canva AI), AI for personalization, chatbots, predictive analytics, ethics and responsible use of AI, Future trends in digital marketing.		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1. Philip Kotler, Hermawan Kartajaya, Iwan Setiawan, Marketing 5.0: Technology for Humanity, Wiley. 2. Dave Chaffey and Fiona Ellis-Chadwick, Digital Marketing: Strategy, Implementation and Practice, Pearson Education, 8th Edition.
ReferenceBook: 1. Ian Dodson, The Art of Digital Marketing, Wiley. 2. Ryan Deiss and Russ Henneberry, Digital Marketing for Dummies, Wiley. 3. Damian Ryan, Understanding Digital Marketing, Kogan Page.
e-Resources
NPTEL – AI in Marketing (IIT Roorkee) https://onlinecourses.nptel.ac.in/noc24_mg05/preview Google Digital Garage – Digital Marketing & E-commerce https://grow.google/intl/en_in/digital-marketing-ecommerce-course/



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

OE-II

25UGCVOE406C ENGINEERING ECONOMICS

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ICE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisite :

Basic knowledge of Mathematics, Fundamental understanding of Accounting and Financial Principles.

Course Objectives :

After completing this course, the student will be able to:

- CO1:** Develop an understanding of fundamental economic principles and their application to engineering decision-making.
- CO2:** Enable students to analyze demand, supply, market behavior, and various demand forecasting techniques.
- CO3:** Introduce different cost concepts, cost-volume-profit analysis, and break-even analysis used in industrial organizations.
- CO4:** Provide knowledge of accounting principles, depreciation methods, and economic evaluation techniques for engineering projects.
- CO5:** Familiarize students with the Indian banking system, functions of the Reserve Bank of India (RBI), and the impact of Liberalization, Privatization, and Globalization (LPG) on the economy.

Course Outcomes:

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

- CO1:** Explain the objectives of firms and apply economic principles in engineering and managerial decision-making.
- CO2:** Analyze demand, supply, elasticity, and demand forecasting techniques for business applications.
- CO3:** Evaluate different cost concepts and apply cost-volume-profit and break-even analysis for organizational planning.
- CO4:** Apply accounting principles, depreciation methods, and time value of money concepts in engineering economic analysis.
- CO5:** Describe the structure of the Indian economy, banking system, RBI functions, and assess the impact of Liberalization, Privatization, and Globalization on economic development.

Module 01	Engineering Economics – An Overview	7hrs
Introduction to Economics, Definition and Scope of Engineering Economics, Basic Economic Problems, Relationship among Science, Engineering, Technology, and Economics. Objectives of the Firm: Profit Maximization, Sales Revenue Maximization, Growth Maximization, Utility Maximization, and Wealth Maximization.		
Module 02	Theory of Demand – An Overview	7hrs
Demand Schedule, Characteristics of Demand, Law of Demand, Exceptions to the Law of Demand, Price Elasticity, Income Elasticity, Cross Elasticity of Demand, Demand Forecasting, Factors Affecting Demand Forecasting, and Methods of Demand Forecasting.		
Module 03	Cost Concepts – An Overview	8hrs
Classification of Costs, Fixed Cost, Variable Cost, Average Cost, Marginal Cost, Opportunity Cost, Accounting Cost, Economic Cost, Cost-Volume-Profit Analysis, Break-Even Analysis, and Operating Leverage.		
Module 04	Accounting Concepts – An Overview	8hrs
Basic Accounting Concepts, Double Entry System, Journal, Ledger, Trial Balance, Final Accounts, Bookkeeping System, Depreciation: Meaning, Objectives, Methods of Depreciation including Straight Line Method, Declining Balance Method, Sum-of-the-Years'-Digits Method, and Numerical Problems.		
Module 05	Indian Economy – An Overview	7hrs
Features of the Indian Economy, Commercial Banking System, Functions of Commercial Banks, Functions of RBI, Liberalization, Privatization and Globalization (LPG), WTO, GATT, TRIPS, Monetary Policy, and Fiscal Policy.		
Module 06	Basic Methodologies of Engineering Economic Analysis	7hrs
Minimum Attractive Rate of Return (MARR), Payback Period Method, Present Worth Method, Future Worth Method, Annual Worth Method, Rate of Return Method, Internal Rate of Return (IRR), Modified/Internal Rate of Return (MIRR), and Engineering Project Evaluation Techniques.		

Internal Continuous Assessment
One Assignment on each unit
References:
TextBooks: 1. Riggs, Bedworth and Randhwa, <i>Engineering Economics</i>, McGraw Hill Education India. 2. S. C. Sharma and T. R. Banga, <i>Industrial Organisation and Engineering Economics</i>, Khanna Publishers. 3. S. K. Misra and V. K. Puri, <i>Economic Environment of Business</i>, Himalaya Publishing House. 4. K. Rajeswara Rao and G. Prasad, <i>Accounting and Finance</i>, Jai Bharat Publishers. 5. Francis Cherunilam, <i>Business Environment: Text and Cases</i>, Himalaya Publishing House.
ReferenceBook: 1. A. Singh and A. N. Sath, <i>Industrial Economics</i>, Himalaya Publishing House. 2. H. L. Ahuja, <i>Managerial Economics</i>, S. Chand Publishing. 3. Datt and Sundharam, <i>Indian Economy</i>, S. Chand Publishing.



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute

Second Year B.Tech. (Civil Engineering), Semester-IV

OE-II

25UGCVOE406D DRONE TECHNOLOGY

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ICE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisite :

Basics of Mechanical Engineering, Basics of Electrical and Electronics Engineering & Fundamentals of Programming (Preferred)

Course Objectives :

After completing this course, the student will be able to:

- CO1:** To introduce students to the fundamentals, architecture, and operating principles of drone and unmanned aerial systems (UAS).
- CO2:** To develop an understanding of drone components, sensors, actuators, propulsion systems, and embedded controllers.
- CO3:** To enable students to analyze flight dynamics, stability, communication systems, and navigation techniques used in drones.
- CO4:** To provide basic programming and simulation skills for autonomous drone operation and mission planning.
- CO5:** To encourage the application of drone technology in agriculture, surveillance, mapping, logistics, disaster management, and emerging smart technologies.

Course Outcomes:

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

- CO1:** Explain the evolution, classification, components, regulations, and safety practices of drone systems.
- CO2:** Identify and compare different drone platforms, airframes, propulsion systems, and power sources.
- CO3:** Select suitable sensors and actuators for specific drone applications and interpret sensor data.
- CO4:** Analyze flight control systems, communication protocols, flight dynamics, and stabilization techniques.
- CO5:** Develop simple drone control programs and perform basic simulations using open-source software.
- CO6:** Evaluate real-world applications and future trends including AI-enabled drones, drone swarms, and autonomous aerial systems.

Module 01	Introduction to Drone Technology	7hrs
Introduction to UAV and UAS, History and Evolution of Drones, Classification of Drones (Fixed-wing, Rotary-wing, Hybrid VTOL), Basic Drone Terminology, Major Components of Drone Systems, DGCA Regulations and Drone Rules (Overview), Drone Safety, Ethics, Privacy and Legal Issues		
Module 02	Drone Structures and Propulsion Systems	7hrs
Drone Frame Configurations (Tricopter, Quadcopter, Hexacopter, Octocopter), Airframe Materials and Fabrication Techniques, BLDC Motors, Propellers, Electronic Speed Controllers (ESC), Battery Technologies (Li-Po, Li-Ion), Power Distribution Board (PDB), Payload Integration including Camera, GPS and Delivery Systems		
Module 03	Sensors, Actuators and Navigation Systems	8hrs
IMU (Accelerometer, Gyroscope), Magnetometer, GPS/GNSS, Barometer, Ultrasonic Sensors, Infrared Sensors, LiDAR, Vision Sensors, RF Modules, Servo Motors and BLDC Motors, Sensor Fusion, Data Acquisition, Obstacle Detection and Navigation Principles		
Module 04	Flight Control and Communication Systems	8hrs
Basics of Flight Dynamics, Stability and Control, Flight Controllers (KK2, APM, Pixhawk, Cube Orange), PID Control Fundamentals, Communication Protocols (PWM, PPM, SBUS, MAVLink), Telemetry Systems, Ground Control Software (Mission Planner, QGroundControl), Flight Modes		
Module 05	Drone Programming and Simulation	7hrs
Introduction to Arduino and Python Programming, Basic Drone Commands, Autonomous Take-off, Hovering and Landing, Introduction to ROS and MAVSDK, Simulation Platforms (PX4 SITL, Gazebo, AirSim), Mission Planning, Waypoint Navigation and Autonomous Flight Concepts		
Module 06	Applications of Drone Technology and Future Trends	7hrs
Precision Agriculture, Crop Health Monitoring, Surveying and Mapping, Photogrammetry, Infrastructure Inspection, Logistics and Parcel Delivery, Disaster Response, Defense and Surveillance, Drone Swarms, Artificial Intelligence in Drones, Urban Air Mobility (UAM), Future Scope of Drone Technology		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1. Drone Technology: Law and Regulation, by Dr. Pavan Duggal, Publisher: Universal Law Publishing. 2. Unmanned Aerial Vehicle (UAV): Design, Fabrication and Testing, by A. P. Kulkarni and S. A. Nalbalwar, Publisher: LAP Lambert Academic Publishing. 3. Design and Development of Unmanned Aerial Vehicles (UAV), by N. A. Shinde and Dr. G. B. Bhole, Publisher: Technical Publications, Pune. 4. Mechatronics, by Dr. R. K. Rajput, Publisher: S. Chand Publishing. 5. Robotics and Control, by R. K. Mittal and I. J. Nagrath, Publisher: McGraw Hill India. 6. Make: Drones – Teach an Arduino to Fly, by David McGriffy, Publisher: Maker Media Publishing.
Reference Book: 1. Small Unmanned Aircraft: Theory and Practice by Randy Beard & Timothy McLain, Princeton University Press Publishing. 2. Introduction to UAV Systems by Paul G. Fahlstrom & Thomas J. Gleason, Wiley Publishing. 3. Building Your Own Drones: A Beginners' Guide by John Baichtal, Que Publishing. 4. Unmanned Aerial Vehicles: Embedded Control by Rogelio Lozano, ISTE Press–Elsevier Publishing.



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute

Second Year B.Tech. (Civil Engineering), Semester-IV

OE-II

25UGCVOE406E COMPUTER AIDED MODELLING

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ICE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisite :

Basic Computer Skills, Knowledge of Engineering Graphics & Fundamental understanding of Engineering Drawing.

Course Objectives :

After completing this course, the student will be able to:

CO1:To understand the fundamentals of Computer Aided Design (CAD) and its applications in engineering design and manufacturing.

CO2:To apply two-dimensional (2D) and three-dimensional (3D) geometric transformation techniques in computer graphics.

CO3:To understand various geometric modeling techniques used for creating engineering models.

CO4:To learn the concepts, representation methods, and applications of solid modeling.

CO5:To develop complex engineering models using feature-based modeling and Boolean operations.

CO6:To understand the integration of CAD with Computer Aided Manufacturing (CAM), Computer Aided Engineering (CAE), rapid prototyping, and emerging digital manufacturing technologies.

Course Outcomes:

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

CO1:Explain the concepts of CAD, product development, and the role of CAD in the product lifecycle.

CO2:Apply 2D and 3D transformation techniques to engineering graphics and CAD models.

CO3:Compare wireframe, surface, and solid modeling techniques with their advantages and limitations.

CO4:Create and manipulate solid models using different representation schemes.

CO5:Develop engineering assemblies using feature-based modeling and Boolean operations.

CO6:Demonstrate the integration of CAD with CAM, CAE, additive manufacturing, and modern product development technologies.

Module 01	Introduction to CAD	7hrs
Introduction to CAD, Evolution of CAD Systems, Product Design Process, Product Lifecycle Management (PLM), CAD/CAM/CAE Overview, Advantages and Applications of CAD, CAD Hardware Components, Input and Output Devices, Graphics Standards, Selection of CAD Software.		
Module 02	Computer Graphics and Geometric Transformations	7hrs
Computer Graphics Fundamentals, Coordinate Systems, Windowing and Viewing Concepts, 2D and 3D Geometric Transformations, Translation, Scaling, Rotation, Reflection (Mirror), Shearing, Homogeneous Coordinate System, Composite and Inverse Transformations, CAD Data Exchange Standards (IGES, STEP, STL).		
Module 03	Geometric Modeling	8hrs
Introduction to Geometric Modeling, Wireframe Modeling, Surface Modeling, Parametric Curves, Hermite Curves, Bézier Curves, B-Spline Curves, NURBS Introduction, Surface Generation Techniques, Viewing and Visualization Methods.		
Module 04	Solid Modeling	8hrs
Introduction to Solid Modeling, Boundary Representation (B-Rep), Constructive Solid Geometry (CSG), Sweep Representation, Primitive Solids, Feature-Based Solid Modeling, Parametric Modeling, Applications and Advantages of Solid Modeling.		
Module 05	Advanced Modeling Techniques	7hrs
Boolean Operations (Union, Difference, Intersection), Feature-Based Modeling, Assembly Modeling, Constraints in Assemblies, Exploded Views, Bill of Materials (BOM), Interference Checking, Introduction to Finite Element Analysis (FEA) using CAD Models.		
Module 06	Rapid Prototyping and Emerging Trends	7hrs
Introduction to Rapid Prototyping, Additive Manufacturing Processes, 3D Printing Technologies and Materials, Reverse Engineering CAD-CAM-CAE Integration, Digital Twin Concept, Generative Design, Artificial Intelligence in CAD, Virtual Reality (VR) and Augmented Reality (AR) Applications in Product Design.		

Internal Continuous Assessment
One Assignment on each unit
References:
TextBooks: 1. IbrahimZeid,5CAD/CAMTheoryandPractice”,TataMcGrawHillPublication, 2. M.P.Grover,Zimmer,5CAD/CAM/CIM”,PrenticeHallIndia. 3. ChouguleN.K.,5CAD/CAM/CAE”,SCITECHPublications(I)Pvt.Ltd. 4. FarazdakHaideri,5CAD/CAMandAUTOMATION”,NiraliPrakashan
ReferenceBook: 1. RaoP.N,5IntroductiontoCAD/CAM”,TataMcGrawHillPublishingCo. 2. Martenson,E.Micheal,GeometricModelling,JohnWiley&Sons,1995. 3. SingeresuS.Rao,EngineeringOptimizationTheoryandPractice,NewAgeInternational Limited Publishers, 2000.
e-Resources
1. https://nptel.ac.in/courses/112102102 2. https://nptel.ac.in/courses/112104031



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute

Second Year B.Tech. (Civil Engineering), Semester-IV

OE-II

25UGCVOE406F DATA STRUCTURE USING JAVA

Teaching Scheme		Examination Scheme	
Lectures	3 Hours/ week	ICE	20
Tutorial	0 Hours / week	MSE	20
Practical	0 Hours / week	ESE	60
Credits	3		

Course Prerequisite :

Basic knowledge of Java Programming, Understanding of Object-Oriented Programming Concepts & Basic knowledge of mathematical logic and problem solving.

Course Objectives :

After completing this course, the student will be able to:

- CO1:** To understand the fundamental concepts of data structures, abstract data types, and algorithm analysis using Java.
- CO2:** To develop efficient searching and sorting algorithms and evaluate their performance using complexity analysis.
- CO3:** To implement linear data structures such as stacks and queues using Java and apply them to real-world problem solving.
- CO4:** To design and implement linked data structures for efficient storage, retrieval, and manipulation of data.
- CO5:** To understand tree-based data structures, balanced trees, and their applications in hierarchical data processing.
- CO6:** To explore hashing and graph data structures and implement efficient algorithms using Java.

Course Outcomes:

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

- CO1:** Analyze algorithms and classify data structures based on their time and space complexities using Java.
- CO2:** Implement and compare searching and sorting techniques for efficient data processing.
- CO3:** Develop stack and queue applications using Java for expression evaluation and other computational problems.
- CO4:** Design and manipulate linked lists to solve dynamic data storage and management problems.
- CO5:** Implement binary trees, binary search trees, and balanced trees for hierarchical data organization and retrieval.
- CO6:** Apply hashing techniques and graph traversal algorithms using Java to solve practical computing problems.

Module 01	Fundamentals of Data Structures and Algorithm Analysis	7hrs
Introduction to Data Structures, Data Types, Abstract Data Types (ADT), Elementary Data Organization, Operations on Data Structures (Traversal, Insertion, Deletion, Searching, Sorting), Algorithm Analysis, Time and Space Complexity, Asymptotic Notations (Big-O, Omega, Theta), Recursion Basics, Performance Analysis using Java.		
Module 02	Searching and Sorting Techniques	7hrs
Searching Algorithms: Linear Search, Binary Search; Sorting Algorithms: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort; Stability and Efficiency of Sorting Algorithms, Performance Comparison, Java Implementation and Complexity Analysis.		
Module 03	Stack and Queue Data Structures	8hrs
Stack ADT, Operations (Push, Pop, Peek), Applications: Expression Conversion, Expression Evaluation, Parenthesis Matching; Queue ADT, Circular Queue, Priority Queue, Double Ended Queue (Deque), Implementation using Arrays and Linked Lists in Java, Complexity Analysis.		
Module 04	Linked Lists and Applications	8hrs
Singly Linked List, Doubly Linked List, Circular Linked List, Header Linked List, Operations: Insertion, Deletion, Traversal, Searching, Applications in Stack, Queue, Polynomial Manipulation, Memory Management, Java Implementation and Complexity Analysis.		
Module 05	Trees and Balanced Trees	7hrs
Tree Concepts and Terminology, Binary Tree Representation and Traversals (Preorder, Inorder, Postorder), Binary Search Tree (BST), AVL Trees and Rotations, Threaded Binary Trees (Concept), Heap Trees (Introduction), Applications of Trees, Java Implementation and Complexity Analysis.		
Module 06	Hashing and Graph Data Structures	7hrs
Hash Functions, Collision Resolution Techniques (Chaining, Linear Probing, Quadratic Probing, Double Hashing), Hash Tables and Dictionaries, Graph Terminology, Graph Representation (Adjacency Matrix and Adjacency List), Graph Traversals (BFS and DFS), Introduction to Minimum Spanning Tree and Shortest Path Algorithms, Applications of Graphs, Java Implementation and Complexity Analysis.		

Internal Continuous Assessment
One Assignment on each unit
References:
Text Books: 1. Richard F. Gilberg & Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, Cengage Learning, second edition. ISBN-10: 0534390803. 2. Seymour Lipschutz, Data Structure with C, Schaum's Outlines, Tata McGraw Hill. ISBN- 10: 1259029964. 3. E. Balgurusamy - Programming in ANSI C, Tata McGraw-Hill, Third Edition. ISBN-10: 1259004619. 4. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum (3 Data structures using C and C++ - PHI Publications, Second Edition). ISBN 10: 8120311779.
Reference Book: 1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company 2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education. 3. Ellis Horowitz, Sartaj Sahni, "5 Fundamentals of Data Structures", Galgotia Books Source. ISBN 10: 0716782928



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVAE407 PROFESSIONAL APTITUDE AND PROFICIENCY

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	50
Tutorial	0 Hours / week	MSE	--
Practical	0 Hours / week	ESE	--
Credits	2		

Course Prerequisite :

This course requires basic knowledge of communication language- oral and writing skill

Course Objectives :

After completing this course, the student will be able to:

CO1:Develop quantitative, verbal, and logical reasoning skills for competitive exams (GATE, CAT, GRE, placements).

CO2:Enhance problem-solving speed and accuracy through structured techniques

CO3:Build critical thinking and decision-making abilities

CO4:Familiarize students with exam patterns, shortcuts, and time management

Course Outcomes:

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

CO1:Solve quantitative problems with 80%+ accuracy.

CO2:Interpret data sets and logical puzzles critically

CO3:Demonstrate improved verbal/non-verbal reasoning skills

CO4:Apply time-management techniques in exams

Module 01	Quantitative Aptitude Basics	2hrs
• Number systems, percentages, ratios, averages, profit/loss. • Objective: Strengthen foundational math skills. • Outcome: Solve arithmetic problems efficiently.		
Module 02	Algebra & Data Interpretation	4hrs
• Linear equations, graphs, tables, pie charts. • Objective: Interpret and analyze data sets. • Outcome: Extract insights from visual/quantitative data.		
Module 03	Logical Reasoning Verbal Ability & Non-Verbal Reasoning	5hrs
• Syllogisms, blood relations, coding-decoding, series. • Objective: Improve deductive and analytical reasoning. • Outcome: Solve logic puzzles systematically. • Grammar, vocabulary (synonyms/antonyms), para-jumbles. • Objective: Master English comprehension and error-spotting. • Outcome: Construct grammatically correct sentences. • Pattern recognition, mirror images, paper folding. • Objective: Develop spatial and visual reasoning. • Outcome: Decode complex patterns quickly.		
Module 04	Group Discussion Skills	4hrs
• Role of GD in selection process, tips for effective GD Participation, DOS & DNTs of effective group participation and body language and time management in group decision		
Module 05	Mock Tests & Time Management	5hrs
• Full-length practice tests (GATE/CAT-style). • Objective: Simulate exam pressure and refine strategies. • Outcome: Improve speed/accuracy under timed conditions.		

Internal Continuous Assessment

Minimum 10 assignments from the list

- **Resume Creation:** Students will prepare a one-page ATS-friendly resume tailored to their job description.
- **Email and Letter Writing:** Each student will draft a formal email and a cover letter intended for a job application.
- **Notice, Agenda, and Minutes of Meeting Writing:** Write the Notice, Agenda, and Minutes of Meeting for a business meeting.
- **Public Speaking:** Just a Minute (JAM) & Elevator Pitch activity.
- **Self-Grooming Journal:** Students will maintain a grooming and time-management journal for three consecutive days, documenting habits, self-discipline practices, and areas of improvement.
- **SWOT Analysis of Personality:** Each student will perform a personal SWOT analysis to identify their strengths, weaknesses, opportunities, and threats in the context of personality development and employability.
- **Mock Group Discussion:** Students will participate in mock GDs on current topics and offer constructive feedback.
- **Mock Personal Interviews:** Students will undergo mock HR interview simulations in front of peers and instructors, followed by personalized feedback on performance and body language.
- **Body Language Analysis:** Record the responses of students during the interview, and the instructor will analyze their body language and provide personalized feedback.
- **Grooming and Etiquette Demonstration:** In this session, students will observe and demonstrate proper grooming standards, professional dress codes, and social etiquette suitable for interviews and corporate environments.
- **Time Management Activity:** Students will prepare a Vision Board activity where they have to set their long-term goals chronologically.
- **Leadership and Teamwork Exercises:** Solving and discussing self and business case studies.

References-

Text Books:

1. Quantitative Aptitude for Competitive Exams- R.S. Aggarwal.
2. A Modern Approach to Verbal & Non-Verbal Reasoning-R.S. Aggarwal.
3. Official GRE/GATE/CAT guides.

Reference Books

Soft Skills: A Textbook for Undergraduates – Ajay R. Tengse, Orient Black Swan
Communication Skills – Sanjay Kumar & Pushpa Lata, Oxford University Press.
Managing Soft Skills for Personality Development – B. N. Ghosh, McGraw-Hill.
Soft Skills for Everyone – Jeff Butterfield, Cengage Learning.
Soft Skills for Managers – Dr. T. Kalyana Chakravarthi & Dr. T. Latha Chakravarthi, Biztantra Publication.

e-Resources

NPTEL – Soft Skills Development (IIT Kharagpur / IIT Madras) 
<https://nptel.ac.in/courses/109/105/109105115/>
SWAYAM – Life Skills for Engineers-  https://swayam.gov.in/nd1_noc20_hs36/preview



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVVE408 ENVIRONMENTAL EDUCATION

Teaching Scheme		Examination Scheme	
Lectures	2 Hours/ week	ISE	50
Tutorial	0 Hours / week	MSE	--
Practical	0 Hours / week	ESE	--
Credits	2		

Course Prerequisite :

1. Fundamental understanding of science and environmental concepts acquired at the school level.
2. General awareness of present-day environmental issues and sustainability challenges.

Course Objectives :

The objectives of this course are to:

- CO1:**Create awareness of environmental concerns and their regional as well as global significance.
CO2:Develop an understanding of ecosystems, biodiversity, and sustainable management of natural resources.
CO3:Familiarize students with pollution sources, environmental protection techniques, and waste management systems.
CO4:Enhance knowledge of climate change, biodiversity conservation, and sustainable development principles.
CO5:Encourage ethical values and responsible environmental practices in engineering and societal decision-making.

Course Outcomes:

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

- CO1:**Explain the structure, functions, and interactions within ecosystems and biogeochemical cycles.
CO2:Recognize different types of environmental pollution and assess their impacts on ecosystems and public health.
CO3:Examine the significance of natural resources in achieving sustainable development.
CO4:Interpret environmental legislation, policies, and international environmental agreements.
CO5:Recommend sustainable environmental practices and community-oriented solutions for environmental protection.
CO6:Exhibit environmental ethics and professional responsibility while addressing engineering and societal challenges.

Module 01	Fundamentals of Environment and Ecosystems	5 hrs
Develop an understanding of environmental education and the essential principles of ecosystems, including food chains, food webs, and ecological pyramids. Study major biogeochemical cycles such as water, carbon, nitrogen, and phosphorus, along with biodiversity, its significance, major threats, and conservation strategies		
Module 02	Natural Resources and Sustainable Development	6 hrs
Explore renewable and non-renewable natural resources such as water, forests, minerals, energy, and land. Examine issues related to resource depletion, sustainable utilization, conservation methods, watershed management, rainwater harvesting, and water conservation practices.		
Module 03	Environmental Pollution and Management	6 hrs
Understand various forms of pollution including air, water, soil, noise, thermal, and radioactive pollution, along with their effects on human health and ecosystems. Study pollution prevention and treatment methods, including Effluent Treatment Plants (ETPs), Sewage Treatment Plants (STPs), filtration systems, green belts, solid waste management, and e-waste management practices.		
Module 04	Climate Change and Environmental Conservation	6 hrs
Gain knowledge of global environmental challenges such as climate change, greenhouse gas emissions, global warming, and ozone layer depletion. Examine adaptation and mitigation measures, and study environmental movements including Chipko, Narmada Bachao Andolan, and Fridays for Future, emphasizing the contributions of youth, NGOs, and local communities.		
Module 05	Environmental Legislation and Governance	6 hrs
Study important environmental laws in India, including the Water Act (1974), Air Act (1981), Environment (Protection) Act (1986), and Forest Conservation Act. Understand international environmental agreements such as the Rio Summit, Kyoto Protocol, Paris Agreement, and Sustainable Development Goals (SDGs). Learn the functions of regulatory organizations like MoEFCC, CPCB, and SPCBs, along with Environmental Impact Assessment (EIA) and public participation.		



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVPC409L HYDRAULICS ENGINEERING LABORATORY

Teaching Scheme		Examination Scheme	
Lectures	0 Hours/ week	ISE	30
Practical	2 Hours / week	ESE	20
Credits	1		

Course Prerequisite :

Basic Physics, Basic Engineering Mechanics, Basic Mathematics

Course Objectives :

After completing this course, the student will be able to:

- CO1:** Develop practical competency in fluid measurement and analysis techniques using standard laboratory devices to simulate real-world hydraulic conditions.
- CO2:** Foster critical understanding of fluid behavior through experimental validation of key concepts in pipe systems.

Course Outcomes:

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

- CO1:** Demonstrate the ability to conduct standard hydraulic experiments using various tools and accurately interpret results relevant to civil engineering applications.
- CO2:** Analyze and validate theoretical fluid mechanics principles through structured experimentation and data analysis.
- CO3:** Evaluate the performance of flow-measuring devices and pipe systems, and recommend appropriate engineering solutions.

Minimum Seven Experiments Should Conduct

Expt. No.	Description	Hrs
01	Measurement of the Viscosity of a fluid.	2
02	Measurement of Discharge in Measuring Tank.	2
03	Calibration of Measuring Tank.	2
04	Verification of Bernoulli's Theorem.	2
05	Determination of Metacentric Height of Model.	2
06	Determination of Major Loss due to Friction in Pipe.	2
07	Determination of Minor Losses in Pipe	2
08	Flow Measurement by Venturi meter.	2
09	Demonstrations of working of different types of valves and pipe fittings	2
10	Study of Turbines (Demonstration)	2
11	Tests on Centrifugal Pumps/ Study on Charts of Selection of Pump	2

References:**Text Books:**

- 1) A Textbook of Fluid Mechanics and Hydraulic Machines, Dr. R. K. Bansal, Laxmi Publications, 3rd Edition.
- 2) Fluid Mechanics and Hydraulic Machines, Dr. D. S. Kumar, S. K. Kataria & Sons, 10th Revised Edition.
- 3) Hydraulic Engineering, John A. Roberson, Clayton T. Crowe, and Fredrick A. Chilton, Wiley Publication, 2nd Edition

Reference Book:

- 1) Fluid Mechanics - V. L. Streeter and E. B. Wile- McGraw-Hill International Book Co... Auckland.
- 2) Elementary Fluid Mechanics - H. Rouse-Toppan C. Ltd., Tokyo.
- 3) Fluid Mechanics - Shames - McGraw-Hill International Book Co.
- 4) Fluid Mechanics-Munson, Young- Wiley India.
- 5) Mechanics of Fluids- M.C. Potter. Wiggert, Ramadan-Cengage Le

Virtual Labs:

- 1) Fluid Mechanics Lab - NITK
- 2) Fluid Mechanics - IIT Bombay
- 3) Fluid Mechanics Lab - IIT Kharagpur



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute

Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVPC410L SURVEYING LABORATORY

Teaching Scheme		Examination Scheme	
Lectures	0 Hours/ week	ISE	30
Tutorial	0 Hours / week	MSE	00
Practical	2 Hours / week	ESE	20
Credits	2		

Course Prerequisite :

Engineering Mathematics, Engineering Mechanics, Basic Civil Engineering,

Course Objectives :

After completing this course, the student will be able to:

- CO1:** Conduct laboratory tests on Survey works, and prepare map/drawings to the required scale.
CO2: Use of survey data, maps and applications.

Course Outcomes:

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

- CO1:** Perform leveling & survey work on various civil engineering works
CO2: Perform laying measurement on field and prepare maps of surveying works

Course Content

Practical Work consists of any ten experiments minimum from List (a) , (b) & (c) , (d) below and detailed reporting in form of journal and Project Reports. Practical examination shall be based on above and 2 project as below.

Project survey – 1. Contour survey- Block Contouring project
2. Profile leveling- Road survey project

Experiment of Linear measurement

1. Measuring a straight line with chain and tape.
2. Measuring a offsets of both side of line.
3. Measuring a straight line with Subtense bar.

Experiment on Plane table

1. Method of radiation.
2. Method of intersection
3. Method of resectioning two point problem, three point problem.
4. Traversing by plane table.

Experiment on Leveling

1. Differential leveling by Dumpy level.
2. Differential leveling by Auto level.

Experiment on Angular measurement

1. Measuring horizontal angles by Prismatic Compass.
2. Measuring horizontal angle by theodolite.
3. Measuring vertical angle by theodolite

Internal Continuous Assessment

detailed reporting in form of journal and Project Reports should be submitted on each conducted Experiment, Project.

References:

- 1) SJCIT Surveying Manual
- 2) CE 104 Practical surveying sessional Manual



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-III

25UGCVPC411L

TRANSPORTATION ENGINEERING LABORATORY

Teaching Scheme		Examination Scheme	
Lectures	0 Hours/ week	ISE	30
Tutorial	0 Hours / week	MSE	00
Practical	2 Hours / week	ESE	20
Credits	1		

Course Prerequisite :

Engineering Mathematics, Engineering Mechanics, Basic Civil Engineering, Engineering Surveying, Geotechnical Engineering, and Construction Materials.

Course Objectives :

After completing this course, the student will be able to:

CO1: Conduct laboratory tests on soils, aggregates, and bituminous materials

CO2: interpret results for pavement applications.

Course Outcomes:

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

CO1: Perform tests on various road construction materials.

CO2: Perform CBR tests on local soils to determine subgrade properties needed for roadways.

Course Content

Practical Work consists of all experiments from List (a) and at least six performances among the list (b) below and detailed reporting in form of journal and Project Reports. Practical examination shall be based on above

Tests on Aggregates

1. Shape Test
2. Specific Gravity and Water Absorption Test
3. Stripping Value Test
4. Soundness Test
5. CBR Test on Soil and Aggregates

Test on Bituminous Materials

1. Penetration Test
2. Softening Point Test
3. Flash and Fire Point Test
4. Ductility Test
5. Viscosity Test
6. Specific Gravity Test
7. Demonstration of Marshall Test
8. Pavement design exercise based on flexible pavement consisting of bituminous concrete.
9. Visit to Road construction site for studying different construction equipment's.

Internal Continuous Assessment

detailed reporting in form of journal and Project Reports should be submitted on each conducted Lab

References:

- 1) IRC: 58–2011
- 2) IRC: 37–2012



Shanti Education Society's
A. G. Patil Institute of Technology, Solapur
An Autonomous Institute
Second Year B.Tech. (Civil Engineering), Semester-IV

25UGCVVS412 CIVIL ENGINEERING SOFTWARE (BIM ARCHITECTURE)

Teaching Scheme		Examination Scheme	
Lectures	0 Hours/ week	ISE	30
Tutorial	0 Hours / week	MSE	00
Practical	2 Hours / week	ESE	20
Credits	2		

Prerequisites:

1. AUTOCAD
2. Building, Planning & Drawing

Course Objectives :

The objective of this course are

- CO1:** To introduce the fundamentals of Building Information Modeling (BIM).
- CO2:** To train students in Revit Architecture for 3D modeling of buildings.
- CO3:** To enable the preparation of architectural plans, elevations, and sections using Revit.
- CO4:** To understand BIM workflow for coordination between architectural, structural, and MEP systems

Course Outcomes:

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

- CO1:** Understand BIM concepts and Revit interface.
- CO2:** Create 3D architectural models including walls, doors, windows, and floors.
- CO3:** Generate 2D drawings such as plans, elevations, and sections from the model.
- CO4:** Use annotation, materials, and view settings effectively.
- CO5:** Export project data and collaborate using BIM features.

Module 01	Introduction to BIM and Revit Architecture :	3 hrs
Navigate Revit UI and project setup, Starting a New Project, Levels, and Grids, Create levels and grid lines,		
Module 02	Model a basic structure:	3 hrs
Walls, Doors, Windows, Floors, Roofs, and Ceilings, Insert vertical circulation elements such as Stairs, Ramps, Railings, Rooms, Areas, and Tags		
Module 03	Creating Elevations and Sections:-	3 hrs
Generate views from the model, Schedules and Quantities such as Create schedules for doors, windows, etc..		
Module 04	Materials, Rendering, and Walkthrough:	3 hrs
Apply materials and create walkthrough		
Module 05	Sheets, Printing, and Exporting:-	3 hrs
Create sheets and plot drawings		

Internal Continuous Assessment
1. Create a simple 3D residential building model in Revit. 2. Prepare floor plans, elevations, and sections from the model. 3. Generate door and window schedules. 4. Apply materials and render the building model. 5. Create a walkthrough video of the modeled building.
References:
Textbooks / Reference: 1. Autodesk Revit Architecture User Manual 2. Chynoweth Paul 3 Revit Architecture Fundamentals 3. BIM Handbook by Chuck Eastman, Paul Teicholz, Rafael Sacks Open Source Learning Resources https://www.autodesk.com/education/edu-software/overview https://knowledge.autodesk.com/support/revit