D Y PATIL
COLLEGE of
ENGINEERING & TECHNOLOGY
(AN AUTONOMOUS INSTITUTE)
KASABA BAWADA, KOLHAPUR

D. Y. Patil College of Engineering and Technology
Kasaba Bawada, Kolhapur
(An Autonomous Institute)

Department of Civil Engineering

Third Year B. Tech. Curriculum

(with effect from academic year 2025-26)

D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY, KOLHAPUR

Teaching and Evaluation Scheme from Year 2025-26 (as per NEP-2020)

Third Year B. Tech. Civil Engineering

SEMESTER-V

Sr. No	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical/ Tutorial		Total Marks
				Credits	Contact Hrs.			ISE	MSE	ESE	INT	OE/ PoE	
					L	P	T						
1	231CEPCCL301	PCC	Analysis of Structures	3	3	-	-	20	30	50	-	-	100
2	231CEPCCL302	PCC	Building Planning and Design	3	3	-	-	20	30	50	-	-	100
3	231CEPCCL303	PCC	Transportation Engineering	3	3	-	-	20	30	50	-	-	100
4	231CEPCCP301	PCC	Analysis of Structures Lab	1	-	2	-	-	-	-	25	-	25
5	231CEPCCP302	PCC	Building Planning and Design Lab	1	-	2	-	-	-	-	25	25	50
6	231CEPCCP303	PCC	Transportation Engineering Lab	1	-	2	-	-	-	-	25	25	50
7	231CEPECL301-303	PEC-1	Professional Elective-1	3	3	-	-	20	30	50	-	-	100
8	231CEPECP301-303	PEC-1	Professional Elective-1 Lab	1	-	2	-	-	-	-	25	-	25
9	231CEMDML301	MDM-3	Basic Construction Materials (Online)	4	$2^{\$}$	-	-	20	30	50	25	-	125
10	231CEOECL301-303	OEC-3	Open Elective-3	2	2	-	-	-	-	50	-	-	50
11	231CEMCL301	MC	Finishing School Training V	-	3^{*}	-	-	-	-	-	50^{*}	-	Grade
12	231CECCAP301	CCA	Liberal Learning	-	-	2	-	-	-	-	50^{*}	-	Grade
			Total	**22**	**16**	**10**	**-**	**100**	**150**	**300**	**125**	**50**	**725**

$ - Contact hours for online courses *****-Values not included in total **Min. Marks for Passing**: 40% of total marks of individual course

PEC-1: 301. Foundation Engineering, 302. Ground Improvement Technique, 303. Total Quality Management

OEC-3: 301. Smart Cities, 302. Geographic Information Systems, 303. Environmental Impact Assessment

D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY, KOLHAPUR

Teaching and Evaluation Scheme from Year 2025-26 (as per NEP-2020)

Third Year B. Tech. Civil Engineering

SEMESTER-VI

Sr. No	Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical/ Tutorial		Total Marks
				Credits	Contact Hrs.			ISE	MSE	ESE	INT	OE/ PoE	
					L	P	T						
1	231CEPCCL304	PCC	Design of Steel Structures	3	3	-	-	20	30	50	-	-	100
2	231CEPCCL305	PCC	Estimation and Valuation	3	3	-	-	20	30	50	-	-	100
3	231CEPCCL306	PCC	Fluid Mechanics	2	2	-	-	-	-	50	-	-	50
4	231CEPCCP304	PCC	Design of Steel Structures Lab	1	-	2	-	-	-	-	25	25	50
5	231CEPCCP305	PCC	Estimation and Valuation Lab	1	-	2	-	-	-	-	25	25	50
6	231CEPECL304-306	PEC-2	Professional Elective-2	3	3	-	-	20	30	50	-	-	100
7	231CEPECL307-309	PEC-3	Professional Elective-3	3	3	-	-	20	30	50	-	-	100
8	231CEPECP304-306	PEC-2	Professional Elective-2 Lab	1	-	2	-	-	-	-	25	-	25
9	231CEPECP307-309	PEC-3	Professional Elective-3 Lab	1	-	2	-	-	-	-	25	-	25
10	231CEMDML302	MDM-4	Remote Sensing and GIS	2	2	-	-	-	-	50	-	-	50
11	231CEVSECP301	VSEC	Hydraulic Flow System	2	1	2	-	-	-	-	25	25	50
12	231CEMCL302	MC	Finishing School Training V	-	3*	-	-	-	-	-	50*	-	Grade
13	231CECCAP302	CCA	Liberal Learning	-	-	2	-	-	-	-	50*	-	Grade
			Total	**22**	**17**	**12**	**-**	**80**	**120**	**300**	**125**	**75**	**700**

* - Values not included in total

Min. Marks for Passing: 40% of total marks of individual course

PEC-2: 304. Advance Structural Analysis, 305. Railway and Tunnel Engineering, 306. Solid and Hazardous Waste Management

PEC-3: 307. Earthquake Engineering, 308. Advance Highway Engineering, 309. Advance Surveying

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
KOLHAPUR-416006 (An Autonomous Institute)
B. Tech. Curriculum as per NEP-2020
Third Year B. Tech. Civil Engineering
SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Analysis of Structures	
Course Code: 231CEPCCL301	**Semester: V**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:
In this course, various techniques and their underlying mechanics for figuring out how determinate and indeterminate structures react to external agitation will be covered. The course is thorough on a fundamental level. Students experience in this course will help them lay the groundwork for more advanced structural engineering courses.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	To learn the fundamental concepts of principal stresses and planes under external forces for determinate structural members
2	To learn the analysis of members subjected to moving loads
3	To teach the basics of elastic structural analysis and indeterminate structure behaviour.
4	To use various approaches to investigate indeterminate structures.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL301.1	Apply the concepts and principles of stresses, strains and elastic behaviour of materials.
CL301.2	Evaluate direct and bending stresses of the structures
CL301.3	Evaluate static and kinematic indeterminacy of the structures
CL301.4	Analyze the beams using force and displacement methods.

Prerequisite:	Mechanics of structures

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL301.1	2	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CL301.2	2	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CL301.3	3	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CL301.4	3	3	3	3	-	3	-	-	-	-	-	2	-	-	3

Content	Hours
Unit 1. Principal Stresses and Strains Concept of principal stresses, principal strains and principal planes; Rectangular block subjected to normal stress along and across two planes Combination of normal and tangential stress also with shear stress, normal and shear stresses on an oblique plane Mohr's circle of stress, construction of Mohr's circle	7
Unit 2. Direct and Bending Stresses Define eccentricity, Direct and bending stresses for eccentrically loaded solid and hollow sections of rectangular and circular columns. Kern of section – Pressure distribution of dams and retaining walls, chimneys, etc. Effect of lateral force and self-weight. Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections.	8

Unit 3. Introduction and Indeterminacy of Structure Introduction to force and displacements methods. Approaches to find static and kinematic indeterminacy of frame, truss and beams with numerical problems Application of Consistent deformation methods on propped cantilever and fixed beam.	7
Unit 4. Clapeyron's Three Moment Theorem Application of three moments on continuous beam with different end support conditions Application of three moments on continuous beam with different moment of inertia. Application of three moments on continuous beam with sinking of support.	7
Unit 5. Slope Deflection Method Introduction to slope deflection equation, modified slope deflection equation with Static indeterminacy less than or equal to two. Application of slope deflection equation, modified slope deflection equation on continuous beam, sinking of support, with Static indeterminacy less than or equal to two Application of slope deflection equation, modified slope deflection equation on sway and non-sway portal frames with Static indeterminacy less than or equal to two.	8
Unit 6. Moment Distribution Method Application of moment distribution method on continuous beam, sinking of support with Static indeterminacy less than or equal to two Application of moment distribution method on sway and non-sway portal frames with Static indeterminacy less than or equal to two	8

Text Books:

1	Punmia B. C., A. K. Jain and A. K. Jain, "Mechanics of Materials" -Laxmi Publications(P) Ltd, New Delhi, 2001.
2	Bhavikatti S.S., "Structural Analysis" -Vikas Publications House, New Delhi.
3	Vazirani and Ratwani, "Analysis of Structures" Vol. I & II, Khanna Publishers
4	S. Ramamrutham, R. Narayanan, "Theory of structures" Dhanipat Rai Publishing Company

Reference Books:

1	S. B. Junnarkar and Dr. H. J. Shah, "Mechanics of Structures Vol. I and II" - Charotar Publishing House Pvt Ltd. - Twenty second edition
2	R.K. Bansal, "Strength of Materials" - Laxmi Publications.
3	Devdas Menon, "Structural Analysis", Narosa Publishing House
4	C.S. Reddy, "Basic Structural Analysis", Tata McGraw Hill Publishing House, New Delhi

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Building Planning and Design	
Course Code: 231CEPCCL302	**Semester: V**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

The course includes classification of buildings, provisions of National Building Codes and rules, building byelaws, open area, setbacks, FAR terminology. Also, it includes design and drawing of residential and public buildings.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	To study general bye laws requirements for planning of buildings and acquire knowledge of procedure to sanction a building proposal from local town planning authority.
2	To apply knowledge of residential and public building principles to develop a plan.
3	To study procedures for preparing perspective drawings of various objects.
4	To understand various building services such as plumbing, electrification, Air conditioning, fire resistance, thermal insulation.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to…
CL302.1	Understand and implement Building Bye- Laws, its regulations and Planning and Design residential and public building considering principles of planning
CL302.2	Prepare the submission drawing of residential building.
CL302.3	Illustrate the procedures for preparing perspective drawings of various objects.
CL302.4	Illustrate the concepts of plumbing, electrification, ventilation, air conditioning and thermal insulation.

Prerequisite:	Building Construction

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL302.1	3	-	2	-	-	2	-	2	-	-	-	1	2	2	3
CL302.2	3	-	3	-	2	2	-	-	-	2	-	1	2	2	5
CL302.3	3	-	2	-	-	-	-	-	-	-	-	1	2	2	3
CL302.4	3	-	1	-	-	1	-	-	-	-	-	1	2	2	3

Content	Hours
Unit 1. Introduction Principles of Planning, Sun diagram, wind diagram, Building Byelaws. Planning of Residential Building (Row, Twin Bungalows, and Apartments) Municipal Drawings, Working Drawings, Procedure for obtaining approval, commencement, Plinth completion and Occupancy certificate. Human Body figures and its application in space design. Need of Measured Drawing	7

Unit 2. Planning of Public Building Site selection, Principles of building aesthetics like Unity, Mass-Balance, Symmetry, Contrast, Proportion, Scale, Rhythm, and Accentuation. Character of building. Architectural composition of building and terms such as mass, space, proportion, symmetry, balance, contrast, pattern. Site layout for various types of building such as: Educational buildings - (Younger age range, middle age range), Building for health – (health centers, hospitals), Assembly Buildings – (recreational halls, cinema theatres, restaurants, hotels, clubs), Business and Mercantile buildings – (shops, banks, markets and malls), Industrial Buildings – (factories, workshops, cold storages), Office Buildings- (administrative buildings, corporate office), Buildings for transportation- (Bus stations, Truck Terminal).	10
Unit 3. Perspective Drawings Elements of perspective drawings, Parallel perspective and Angular perspectives of different objects and small buildings.	6
Unit 4. Building Services **Plumbing System:** Various Materials for system like A-PVC, C-PVC, GI, and HDPE. Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing and Drainage plan, introduction to rainwater harvesting. **Electrification:** Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing. **Fire Resistance in Building**: Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire. Introduction to advanced firefighting system, concept of sprinklers, fire detectors, addressing system, refuge areas, etc.	8
Unit 5. Building Systems **Ventilation:** Definition and necessity of Ventilation, functional requirement, various system and selection criteria.	8

Air conditioning: Purpose, Classification, Principles, Systems and Various Components of the same. **Thermal Insulation:** General concept, Materials, Methods. Introduction to **Acoustics:** Absorption of sound, various materials, conditions for good acoustics.	
Unit 6. Sustainability of Building **Sound Insulation:** Types of noise, Methods of noise control. **Maintenance, Repairs, Rehabilitation of Structures:** (Conceptual introduction only) **Low-cost Housing:** Materials and Methods (conceptual introduction only) **Green building**: Concept and rating.	6

Text Books:

1	Y. S. Sane, "Building Design and Drawing" Allied Book Stall, Pune
2	Shah, Kale and Patki "Building Drawing with an integrated approach to Built-Environment", Tata Mcgraw Hill publication
3	B.C. Punmia, "Building Construction", Laxmi Publications.
4	G. K. Hiraskar, "Basic Civil Engineering", Dhanpat Rai Publications.
5	S.P. Arora, S.P. Bindra "A Text Book of Building Construction", Dhanpat Rai Publications.

Reference Books:

1	V.B. Sikka, "A Course in Civil Engineering Drawing" S.K. Kataria and Sons
2	Sandeep Mantri, "A to Z of Practical Building Construction and Its Management" Satya Prakashan, New Delhi
3	SP 7- National Building Code Group 1 to 10- B.I.S. New Delhi
4	Time Saver Standards
5	I.S. 962 – 1989 Code for Practice for Architectural and Building
6	I.S. 962 – 1989 Code for Practice for Architectural and Building

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
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B. Tech. Curriculum as per NEP-2020
Third Year B. Tech. Civil Engineering
SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Transportation Engineering	
Course Code: 231CEPCCL303	**Semester: V**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:
This course will discuss the principles and practices of testing of highway materials. The major topics of this course cover highway geometric design, Design of flexible and rigid pavements, methods of flexible and pavement construction and Traffic Engineering.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	To understand importance of highways, their alignment and geometric design.
2	To understand properties of various pavement materials and make use of the same in design of pavements.
3	To study various pavement construction methods
4	To understand various techniques of Traffic Engineering.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL303.1	Design highway geometrics.
CL303.2	Design flexible and rigid pavements
CL303.3	Describe methods of flexible and pavement construction
CL303.4	Describe various Traffic Engineering techniques.

Prerequisite:	Surveying, Fundamentals of Civil engineering, etc.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL303.1	3	3	3	3	-	-	-	-	-	-	-	3	3	-	3
CL303.2	3	3	3	3	-	-	-	-	-	-	-	3	3	-	2
CL303.3	3	-	-	-	-	-	-	-	-	-	-	3	-	-	2
CL303.4	3	-	-	-	-	-	-	-	-	-	-	3	-	-	2

Content	Hours
Unit 1. Introduction Importance of Transportation, Modes of Transportation, Characteristics of Road Transportation. Highway development and planning: Classification of roads, Current Road Development Program-es in India. Highway alignment and project preparation: Requirements of alignment, Factors controlling Alignment, Preparation of New Highway projects.	6
Unit 2. Geometric design of Highways Introduction; highway cross section elements; sight distance, Design of horizontal alignment- design speed, radius of curves, super elevation, widening of pavements on curves; Design of vertical alignment- types of gradients, vertical curves, design of intersections, problems.	8
Unit 3. Pavement Materials Materials used in Highway Construction- Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements. Problems.	8

Unit 4. Design of Pavements Types of pavements; Flexible pavements: factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; Rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC, Construction of various types of joints.	8
Unit 5. Construction of Pavements **Construction Flexible/Rigid pavement:** Base, Sub base, Shoulders, Embankment Construction, Construction of Gravel Base, Cement Stabilized Sub Bases, WBM Bases, Wet Mix Construction; Crushed Cement Bases & PQC-DLC. **Bituminous Construction and Maintenance:** Preparation and Laying of Tack Coat; Bituminous Macadam, Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-Dense Asphalt Concrete-Interface Treatments and Overlay Construction.	8
Unit 6. Traffic Engineering and Control Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; Study of parking systems; highway lighting	7

Text Books:

1	A. M. Joshi, "Transportation Engineering-I", 1st edition, Electrotech publication,engineering series, Satara
2	L. R. Kadiyali, "Traffic Engineering and Transport Planning", Khanna Publications, New Delhi

Reference Books:

1	L. R. Kadiyali, "Highway Engineering", 10th Edition, Khanna Publications, New Delhi
2	S. K. Khanna, Justo, Veeraragavan, "Highway Engineering", Nem Chand and Bros., Roorkee, 10th Edition
3	Srinivasa Kumar, "Text book of Highway Engineering ", 1st published in 2011 and reprint in 2012,2013, Universities Press (India) Private Limited.,2013.

4	Huang, Yang. H "Pavement Analysis and Design", 2nd edition, Pearson Prentice Hall.2004.
5	Dr. L. R. Kadiyali, "Traffic Engineering and Transport Planning" Khanna Publications, New Delhi
IRC Codes/ MORTH Specifications	
1	IRC: 58, 2015: "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", IRC, N. Delhi, December, 2002.
2	IRC. Pocket Book for Highway Engineers, New Delhi: Indian Road Congress.2006. IS: 73-2006 Indian standard paving bitumen: specification. New Delhi: Bureau of Indian standard, 2006.
3	IRC – 67 "Code of Practice for Road Signs", IRC, New Delhi – 2001.
4	IRC – 37:2001, 2012, 2017, 2018 "Guidelines for Design of flexible Pavements", IRC, New Delhi, 2018.
5	MORTH. Specification for Road and Bridge works. 5th edition, New Delhi: Ministry of Shipping, Road Transport and Highways, Indian Roads Congress

D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Analysis of Structures Lab	
Course Code: 231CEPCCP301	**Semester: V**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: NA**

Course Description:

In this course, various techniques and their underlying mechanics for figuring out how determinate and indeterminate structures react to external agitation will be covered. The course is thorough on a fundamental level. Students experience in this course will help them lay the groundwork for more advanced structural engineering courses.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To learn the fundamental concepts of principal stresses and planes under external forces for determinate structural members
2	To learn the analysis of members subjected to direct and bending stresses.
3	To teach the basics of elastic structural analysis and indeterminate structure behaviour.
4	Using various approaches to investigate indeterminate structures.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP301.1	Apply the concepts and principles of stresses, strains and elastic behaviour of materials.
CP301.2	Evaluate direct and bending stresses of the structures

CP301.3	Evaluate static and kinematic indeterminacy of the structures
CP301.4	Analyze the beams using force and displacement methods.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs)and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP301.1	2	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CP301.2	2	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CP301.3	3	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CP301.4	3	3	3	3	-	3	-	-	-	-	-	2	-	-	3

LIST OF EXPERIMENTS/ACTIVITY

Sr. No.	Title	Hours
1	Assignment bases on analytical problems on principal strains and planes	2
2	Assignment bases on Mohrs graphical method	2
3	Assignment based on direct and bending stresses for eccentrically loaded solid and hollow sections of rectangular and circular columns.	2
4	Assignment based on direct and bending stresses: Pressure distribution of dams and retaining walls, chimneys, etc.	2
5	Assignment based on finding of static indeterminacy of structure	2
6	Assignment based on finding of kinematic indeterminacy of structure	
7	Assignment based on analytical problems on propped cantilever and fixed beam using Consistent deformation methods	2
8	Assignment based on analytical problems on continuous beam for different end support conditions, different M.I. using Clapeyrons three moment theorem	2

9	Assignment based on analytical problems on continuous beam for different end support conditions, different M.I. and sinking of support using Clapeyrons three moment theorem	2
10	Assignment based on analytical problems on continuous beam for different end support conditions, different M.I. using slope deflection method	2
11	Assignment based on analytical problems on continuous beam for sinking of support. using slope deflection method	2
12	Assignment based on analytical problems on frame using slope deflection method	2
13	Assignment based on analytical problems on continuous beam for different end support conditions, different M.I. using moment distribution method	2
14	Assignment based on analytical problems on continuous beam for sinking of support. using moment distribution method	2
15	Assignment based on analytical problems on frame using moment distribution method	2

Text Books:

1	Punmia B. C., A. K. Jain and A. K. Jain, Mechanics of Materials -Laxmi Publications(P) Ltd, New Delhi, 2001.
2	Bhavikatti S.S., Structural Analysis -Vikas Publications House, New Delhi.
3	Vazirani and Ratwani, "Analysis of Structures" Vol. I & II, Khanna Publishers
4	S. Ramamrutham, R. Narayanan, "Theory of Structures" Dhanipat Rai Publishing Company

Reference Books:

1	S. B. Junnarkar and Dr. H. J. Shah, „Mechanics of Structures Vol. I and II" - Charotar Publishing House Pvt Ltd. - Twenty second edition
2	R.K. Bansal, „Strength of Materials" - Laxmi Publications.
3	Devdas Menon, "Structural Analysis", Narosa Publishing House
4	C.S. Reddy, "Basic Structural Analysis", Tata McGraw Hill Publishing House, New Delhi

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Building Planning and Design Lab	
Course Code: 231CEVSECP301	**Semester: V**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 2**
INT Marks: 25	**ESE Marks: 25**

Course Description:

The course includes functionally planning of residential and public buildings with all comfort, services and regulatory aspects

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To study Planning, designing of various residential and public buildings considering principles of planning and Building Bye- Laws and regulations.
2	To understand preparation of submission drawings in standard format.
3	To understand various building services such as plumbing, electrification, Air conditioning, fire resistance, thermal insulation.
4	To study procedures for preparing perspective drawings of various objects.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP301.1	Plan, design of residential and public buildings considering principles of planning and Building Bye- Laws and regulations.
CP301.2	Prepare the submission drawing of residential building.
CP301.3	Illustrate the concepts of plumbing, electrification, ventilation, air conditioning and thermal insulation.
CP301.4	Illustrate the procedures for preparing perspective drawings of various objects.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP301.1	3	2	3	-	2	2	-	1	-	3	-	3	2	2	4
CP301.2	3	2	3	-	2	2	-	1	-	3	-	3	2	2	3
CP301.3	3	-	-	-	-	-	-	-	-	1	-	3	2	2	3
CP301.4	3	-	-	-	-	-	-	-	-	1	-	3	2	2	3

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Hours
1	Sketches of human body dimensions	2
2	Measurement of Residential Building (Bungalow, Row Bungalows, Twin Bungalows, and Apartments)	2
3	Preparation of municipal submission drawing of measured residential building	2
4	Preparation of municipal submission drawing of measured residential building	2
5	Planning and design of residential building (G+1) (any one type from Bungalow, twin bungalow, row house and Apartment) by using AutoCAD.	2
6	Planning and design of residential building (G+1) (any one type from Bungalow, twin bungalow, row house and Apartment) by using AutoCAD.	2
7	Planning and design of residential building (G+1) (any one type from Bungalow, twin bungalow, row house and Apartment) by using AutoCAD.	2
8	Preparation of working drawing for furniture layout by using AutoCAD.	2
9	Preparation of working drawing for electrification system by using AutoCAD.	2
10	Preparation of working drawing for plumbing system by using AutoCAD.	2

11	Project Report of residential building planned above giving details of following systems • Stair Case • Drainage System • Water Supply System • Water Tank • Septic Tank • Design of terrace drainage System.	2
12	Exercises on parallel perspective of simple objects.	2
13	Exercises on angular perspective of simple objects.	2
14	Line plans of public buildings on graph paper of one building from each category.	2
15	Line plans of public buildings on graph paper of one building from each category.	2

Text Books:

1	Shah, Kale, Patki, "Building Drawing" Tata McGraw- Hill
2	Y. S. Sane, "Building Design and Drawing" Allied Book Stall, Pune
3	S. P. Arora and Bindra "Building Construction" Dhanpat Rai Publication, Delhi
4	Dr. B. C. Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction", Laxmi Publications (P) ltd., New Delhi.

Reference Books:

1	V.B. Sikka, "A Course in Civil Engineering Drawing" S.K. Kataria and Sons
2	Sandeep Mantri, "A to Z of Practical Building Construction and Its Management" Satya Prakashan, New Delhi
3	M. M. Goyal, "Handbook of Building Construction" Amrindra Consultancy.
4	Pramod Beri, "Practical Handbook – Buiding Baandhkam Va Dekhrekh Part I and II", DIT publication, third edition. (Marathi Language).
5	Kumar Swami, "Building Planning", Charotar Publication

Codes:

1	SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.
2	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings.

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Transportation Engineering Lab	
Course Code: 231CEPCCP302	**Semester: V**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: 25**

Course Description:

This course will discuss the practices of testing of highway materials viz. road aggregates and bitumen. It will also include design of bituminous mixes.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To check various properties of highway materials as per MORT&H.
2	To design a bituminous mix.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP302.1	Investigate engineering properties of given road aggregate samples.
CP302.2	Investigate engineering properties of given bitumen samples.
CP302.3	Design a bituminous mix

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KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP302.1	3	-	-	3	-	3	-	-	-	-	-	3	3	-	3
CP302.2	3	-	-	3	-	3	-	-	-	-	-	3	3	-	3
CP302.3	3	-	-	3	-	3	-	-	-	-	-	3	3	-	3

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Type	Hours
1	Aggregate Abrasion Test	O	2
2	Aggregate Crushing Strength Test	O	2
3	Aggregate Impact Test	O	2
4	CBR Test	S	2
5	Penetration Test on Bitumen	O	2
6	Softening Point Test	O	2
7	Ductility Test	O	2
8	Flash and Fire Point Test	O	2
9	Stripping Value Test	O	2
10	Marshall Stability Test	O	2
11	Mix Design of BM/ DBM/SDBC/BC	S	4
12	Activity- Road project design	S	2
13	Activity- Poster making Grading of Bitumen	S	2
14	Activity- Presentation on MORTH Specification	S	2
15	Activity- Participation in technical events of pavement design	S	2

(Type: S- Study, **O-** Operational)

Text Books:

1	G. Venkatappa Rao, 'Highway Material Testing and Quality Control', I. K. International Publishing House Pvt. Ltd., New Delhi
2	L. R. Kadiyali, 'Traffic Engineering and Transport Planning', Khanna Publications, New Delhi

Reference Books:

1	L. R. Kadiyali, 'Highway Engineering', 10th Edition, Khanna Publications, New Delhi
2	S. K. Khanna, Justo, Veeraragavan, Highway Engineering, Nem Chand and Bros., Roorkee, 10th Edition
3	R. Srinivasa Kumar, "Text book of Highway Engineering ", 1st published in 2011 and reprint in 2012,2013 , Universities Press (India) Private Limited.,2013.
4	IRC – 67 "Code of Practice for Road Signs", IRC, New Delhi – 2001.
5	IRC: 58, 2015: "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", IRC, N. Delhi, December, 2002.
6	Huang, Yang,H. "Pavement Analysis and Design, 2nd edition, Pearson Prentice Hall.2004.

Codes:

1	1 IS: 73-1992 for paving bitumen
2	2 IS: 1201 to1209-1978 for testing of bituminous materials
3	3 IS: 2386 (Part I -1963) for testing aggregates
4	IRC – 37:2001, 2012, 2017, 2018 "Guidelines for Design of flexible Pavements", IRC, New Delhi, 2018.
5	IS:2720 – 1990 for CBR test.
6	MORTH. Specification for Road and Bridge works. 5th edition, New Delhi: Ministry of Shipping, Road Transport and Highways, Indian Roads Congress
7	IRC. Pocket Book for Highway Engineers, New Delhi: Indian Road Congress.2006. IS: 73-2006 Indian standard paving bitumen: specification. New Delhi: Bureau of Indian standard, 2006.
8	IRC – 67 "Code of Practice for Road Signs", IRC, New Delhi – 2001.
9	IRC: 58, 2015: "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways", IRC, N. Delhi, December, 2002.

D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Second Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Foundation Engineering	
Course Code: 231CEPECL301	**Semester: V**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description: This course deals with calculations of bearing capacity of soil and design of shallow foundation and pile foundation.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	Understand the basics of foundation engineering in the civil engineering projects.
2	Study the load bearing capacity of soil and to calculate foundation settlement.
3	To study the method of design the shallow foundation and pile foundation.
4	To know the techniques for foundation in the water.
5	To study the stability analysis of slopes.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL301.1	Explain aspects of soil investigation and estimate bearing capacity of soil.
CL301.2	Illustrate design concept of shallow foundations and settlement.
CL301.3	Explain design of pile foundation & foundations in water.
CL301.4	Evaluate stability of slopes.

Prerequisite:	Soil Mechanics

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Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL301.1	3	3	-	-	-	-	-	3	-	-	-	-	3	2	2
CL301.2	3	3	3	-	-	-	-	3	-	-	-	-	3	2	3
CL301.3	3	3	3	-	-	-	-	3	-	-	-	-	3	2	3
CL301.4	3	3	-	-	-	-	-	-	-	-	-	-	3	-	3

Content	Hours
Unit 1. Soil Exploration, Site Investigations & Sampling Objectives and Importance of soil exploration & investigation, planning of exploration program, Number of bore holes, spacing of boring and significant depth of exploration, Methods of sub surface exploration. Core Recovery, RQD. Sampling: Types of samples, types of sampler, requirement of good sampler, Bore log and sampling record. RQD	6
Unit 2. Bearing Capacity Evaluation Classification of Foundation, its suitability. Bearing capacity of soil & theories, Modes of failure of soil, Terzaghi's bearing capacity theory, I.S. Code method of bearing capacity evaluation & computation (IS 6403), Effect Factors affecting bearing capacity-water table effect. Bearing capacity evaluation from field tests, Plate load test, S.P.T. (By I.S. Code method).	8
Unit 3. Shallow Foundation and Settlement Criteria for selection and design of foundation, minimum depth of footing, Assumptions & limitations of rigid design analysis. Design of shallow foundations: Isolated, combined, strap footing (Rigid analysis), Raft foundation (Elastic method), Concept of floating foundations. (Structural Design is not expected).	8

Unit 4. Pile Foundation Classification and their uses, Selection of pile & design criteria of pile foundation, Estimation of single pile and group capacity in cohesive soil, cohesion less soil: Static method, Dynamic method, Pile load test, Negative skin friction, Group action piles, spacing of piles in group, Group efficiency. Under reamed piles: Suitability, Details of pile & bulb	8
Unit 5. Foundations in Water Types of caissons, Components of wells foundation, types & choice of shapes, Forces acting on well foundation, Rectification tilt and shift, Sand Island method, Pneumatic caissons, Safety precautions, Caisson disease. Common types of cofferdams, uses and requirements.	8
Unit 6. Slope Stability Analysis Slope classification, modes of slope failure, Infinite slope in cohesive and cohesion less soil, Analysis of stability of finite slope, Taylor's stability number, Improving slope stability and slope protection measures.	7

Text Books:

1	B. C. Punmia, Ashok Kumar Jain, "Soil Mechanics and Foundation Engg", Laxmi Publications Pvt Limited, 16th Edition
2	K.R. Arora, "Soil Mechanics and Foundation Engg.", Standard Publishers Distributors, 2nd Edition

Reference Books:

1	Karl Terzaghi, Mesri, Ralph B. Peck, R. B. Peck, "Soil mechanics in engineering practice", Wiley, 3rd Edition
2	Joseph E. Bowles, "Foundation Analysis and Design", McGraw-Hill Education (India) Private Limited, 5th Edition
3	V. N. S. Murthy, "Soil Mechanics and Foundation Engg." CBS Publishers and Distributors, 2nd Edition
4	Braja M. Das, Nagaratnam Sivakugan, Siva Sivakugan, "Introduction to Geotechnical Engineering", Cengage Learning, 6th Edition
5	P. Purushottam Raj, "Geotechnical Engineering", Dorling Kindersley, 1st Edition

D. Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Ground Improvement Techniques	
Course Code: 231CEPECL302	**Semester: V**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

The soils at construction sites are not always totally suitable for supporting physical infrastructure such as buildings, bridges, highways, tunnels and dams. Under these conditions, soil needs to be treated using ground improvement techniques. Similarly specific types of soil improvement techniques are required in the case of expansive soils and collapsible soil and in the case of earthquake prone areas. T h e course addresses various ground improvement techniques along with principles, design issues and construction procedures.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	Demonstrate knowledge of understanding of soil behavior.
2	Apply various methods of soil improvement.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL302.1	Explain the ground improvement techniques.
CL302.2	Explain the concepts of various soil stabilization techniques.
CL302.3	Justify the use and application of various soil improvement techniques.

Prerequisite:	Fundamental of Civil Engineering, Geotechnical Engineering

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL302.1	3	3	-	-	-	-	-	-	-	-	3	-	3	-	3
CL302.2	3	3	-	-	-	-	-	-	-	-	3	-	3	-	2
CL302.3	3	3	-	-	-	-	-	-	-	-	3	-	3	-	2

Content	Hours
Unit 1. Formation and Development of Ground Introduction, formation of rock, soil and soil profile, Soil distribution in India, Alternations of Ground after formation, Ground improvement potential Need for Ground Improvement, Benefits/Advantages of Ground Improvement, Factors affecting the Strength of Stability of Soil,	8
Unit 2. Compaction and Drainage Method Compaction mechanics – moisture density relationship, compaction lab test, compactive efforts, field process, Compaction quality control Methods of dewatering system Design steps for dewatering system – discharge computation, design of filters	7
Unit 3. Precompression and Vertical Drains Compressibility of soil and consolidation, preloading and surcharge fills, monitoring of compression, vertical drains, wick drains, dynamic consolidation, consolidation by electro-osmosis	8

Unit 4. Vibration Methods and Grouting Vibro-compaction –blasting, vibratory probe, Vibro displacement compaction Aspect of grouting, grouting procedure, application	7
Unit 5. Mechanical, Cementing and Chemical Stabilization Mechanical stabilization- materials, proportioning of materials Portland cement stabilization, Bituminous stabilization, chemical stabilization, construction methods	8
Unit 6. Geosynthetics, Soil reinforcement and in situ Soil Treatment Methods Types, properties of geosynthetic, application of geosynthetic Soil reinforcing - materials, application, Soil nailing, rock anchoring, micropiles	8

Text Books:

1	Dr. P. Purushothama Raj, "Ground Improvement Techniques", Laxmi Publications (p) Ltd, 2005
2	B. C. Punmia, Ashok Kumar Jain, "Soil Mechanics and Foundation Engg", Laxmi Publications Pvt Limited, 16th Edition
3	P. C. Varghese, "Foundation Engineering", PHI Ltd, 2012

Reference Books:

1	Dr. P. Purushothama Raj, "Ground Improvement Techniques", Laxmi Publications (p) Ltd, 2005
2	Jie Han, "Principles and Practice of Ground Improvement", John Wiley & Sons, 2015
3	Manfired R. Hausmann, "Engineering Principles of Ground Modification", McGraw-Hill Pub, Co., 1990.
4	M C. R. Davies, F. Schlosser,"Ground improvement geosystems", Thomas Telford Publishing, 1997
5	Koerner, R. M., "Designing with geosynthetics", Prentice Hall Inc. 1998.
6	https://nptel.ac.in/courses/105108075

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KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Total Quality Management	
Course Code: 231CEPECL303	**Semester: V**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

This course explores the basic terminology and concepts of Total Quality Management (TQM), focusing on quality management systems and how they can be applied to civil engineering projects to achieve customer satisfaction, improve processes, and reduce costs.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1. To study TQM principles, systems, and the organizing and implementation of quality systems.
2. To understand quality management techniques for data collection and analysis.
3. To explore TQM applications in civil engineering projects.
4. To discuss software approaches in TQM and how technology impacts quality systems.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL303.1	Study fundamentals of engineering economics related to quality.
CL303.2	Apply knowledge of project management in the context of cost and quality.
CL303.3	Illustrate the use of software tools in the management of quality and data.
CL303.4	Describe principles of TQM to solve civil engineering problems.

Prerequisite:	Management for Civil Engineering

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL303.1	2	-	-	-	-	-	-	3	-	-	2	3	2	2	1
CL303.2	3	-	-	-	-	-	-	3	-	-	2	3	2	2	3
CL303.3	3	-	-	-	2	-	-	3	-	-	2	3	-	2	3
CL303.4	3	-	-	-	-	-	-	3	-	-	2	3	2	2	4

Content	Hours
Unit 1. Introduction to TQM Definitions of TQM, TOM framework, benefits, awareness, and obstacles, Quality: vision, mission, and policy statements, Importance of TQM in Civil Engineering, Significance of quality in civil engineering projects, Cost implications of poor quality, Role of TQM in achieving customer satisfaction.	8
Unit 2. Principles and Philosophies of Quality Management Contributions of Deming, Juran, Crosby, Taguchi techniques, Introduction to loss function, parameter and tolerance design, signal-to-noise ratio, Concepts of quality circles, Japanese 5S principles, and 8D methodology.	8
Unit 3. Quality Systems Organizing and Implementation Introduction to IS/ISO 9004:2000 – Quality Management Systems, Guidelines for performance improvements, Quality Audits, TQM culture and work study method.	7

Unit 4. Quality Tools and Techniques Process flow diagrams, Pareto analysis, cause-and-effect diagrams, Control charts, histograms, scatter diagrams, and check sheets, Statistical Process Control (SPC) and its applications in civil engineering.	7
Unit 5. Total Quality Management Implementation Steps in implementing TQM in civil engineering organizations, Overcoming barriers to TQM implementation, Role of leadership in TQM, Continuous improvement strategies.	8
Unit 6. Case Studies and Applications of TQM in Civil Engineering Applications of TQM in construction projects, Case studies of TQM success in civil engineering projects, Challenges and Future Trends in TQM for Civil Engineering.	7

Text Books:

1	Dale H. Besterfiled, et al., "Total Quality Management", Pearson Education, Inc.2003. (Indian reprint 2004). ISBN 81-297-0260-6.
2	Evans. J. R. & Lindsay W. M., "The Management and Control of Quality", (5thEdition), South Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
3	Feigenbaum A.V., Total Quality Management, McGraw-Hill, 1991.

Reference Books:

1	S. Sadagopan, "Management Information System" PHI Learning Private Limited, Delhi.
2	Ahire, S. L., Golhar, D. Y., & Waller, M. A. (1996). Development and validation of TQM implementation constructs. Decision Sciences, 27, 23-56.
3	Feigenbaum. A.V. "Total Quality Management", McGraw-Hill, 1991

Course Plan

Course Title: Foundation Engineering Lab	
Course Code: 231CEPECP301	Semester: V
Teaching Scheme: L-T-P: 0-0-2	Credits: 1
INT Marks: 25	ESE Marks: NA

Course Description:

The Foundation Engineering Lab provides in-situ experience in foundation excavation, foundation design and foundation execution. Students will engage in activities to understand the overall process of design, analysis, execution of foundation.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To provide practical knowledge of types of foundations with their suitability.
2	To understand the analysis and design of foundation.
3	To apply theoretical knowledge to develop solution for foundation problems.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to…
CP301.1	Assess type of foundation suitable for particular site.
CP301.2	Conduct analysis and design of foundation
CP301.3	develop solution for in-situ foundation problems.

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B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP301.1	3	3	2	-	-	-	-	-	-	-	-	-	2	1	2
CP301.2	3	3	3	-	-	-	-	3	-	-	-	-	3	1	2
CP301.3	3	3	3	2	-	-	-	3	-	-	-	3	3	1	3

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Hours
1	Soil Investigation Study Activity	2
2	Numericals on Bearing Capacity	2
3	Numericals on Bearing Capacity	2
4	Selection of Appropriate Type of Foundation	2
5	Shallow Foundation Study Activity - I	2
6	Shallow Foundation Study Activity - II	2
7	Pile Foundation Study Activity - I	2
8	Pile Foundation Study Activity - II	2
9	Numerical on Pile Foundation Design	2
10	Study of Well Foundations Activity	2
11	Study of Caisson Foundations Activity	2
12	Study of Cofferdams Activity	2
13	Numerical of Slope Stability Analysis	2
14	Activity on Slope Stability Analysis	2
15	Study of Landslides Activity	2

Text Books:

1	S. K. Duggal, Earthquake Resistance Design of Structure –Oxford Uni. Press
2	A. K. Chopra, Dynamics of Structures- Theory and Applications to Earthquake Engineering – Prentice Hall Publications.

Reference Books:

1	D. J. Dowrick, Earthquake Resistant Structures –John Wiley Publication
2	Mario Paz, Structural Dynamics - CBS Publication

Codes:

1	IS 1893, Part-I, 2016 Criteria for Earthquake Resistant Design of Structures
2	IS 13920 - 2016 Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code of Practice

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B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V Academic Year 2025-26)

Course Plan

Course Title: Ground Improvement Technique Lab	
Course Code: 231CEPECP302	**Semester: V**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: NA**

Course Description:

This laboratory course is designed to demonstrate the knowledge of ground improvement techniques. The soils at construction sites are not always totally suitable for supporting physical infrastructure such as buildings, bridges, highways, tunnels and dams. Under these conditions, soil needs to be treated using ground improvement techniques. Similarly specific types of soil improvement techniques are required in the case of expansive soils and collapsible soil and in the case of earthquake prone areas. The course addresses various ground improvement techniques along with principles, design issues and construction procedures.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	Demonstrate knowledge of understanding of ground improvement techniques.
2	Describe various methods of soil improvement.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP302.1	Explain the ground improvement techniques.
CP302.2	Describe the use and application of various soil improvement techniques.

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KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V Academic Year 2025-26)

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs)and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BT L
CP302.1	-	3	-	2	3	-	-	-	-	-	-	3	3	-	3
CP302.2	-	3	-	2	3	-	-	-	-	-	-	3	3	-	3

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Hours
1	Identifying Soil Problems and Selecting Suitable Ground Improvement Techniques	2
2	Group Activity: Classifying Ground Modification Methods Based on Soil Type	2
3	Preparing a Flowchart for Different Soil Compaction Techniques	2
4	Model Preparation of Stone Column Layout for Soft Soil Areas	2
5	Stone Columns	2
6	Prefabricated Vertical Drains (PVDs)	2
7	Soil Consolidation using Prefabricated Vertical drains and Preloading	2
8	Sketching a Dewatering System for Excavation Below Groundwater Table	2
9	Planning a Groundwater Management Scheme for a Low-Lying Construction Site	2
10	Comparative Chart-Making of Ground Treatment Methods (Mechanical vs. Chemical)	2
11	Case Study Analysis of Successful Ground Improvement Projects in India	2
12	Grouting for Foundation Strengthening in Sandy Soils	2
13	Micropile for an Urban Building Site	2
14	Poster-Making: Types of Geosynthetics and Their Uses in Civil Engineering	2
15	Developing a Decision Tree for Selecting Geosynthetics Based on Application	2

Text Books:

1	Dr. P. Purushothama Raj, "Ground Improvement Techniques", Laxmi Publications (p) Ltd, 2005
2	B. C. Punmia, Ashok Kumar Jain, "Soil Mechanics and Foundation Engg", Laxmi Publications Pvt Limited, 16th Edition
3	P. C. Varghese, "Foundation Engineering", PHI Ltd, 2012

Reference Books:

1	Dr. P. Purushothama Raj, "Ground Improvement Techniques", Laxmi Publications (p) Ltd, 2005
2	Jie Han, "Principles and Practice of Ground Improvement", John Wiley & Sons, 2015
3	Manfired R. Hausmann, "Engineering Principles of Ground Modification", McGraw-Hill Pub, Co., 1990.
4	M C. R. Davies, F.Schlosser, "Ground improvement geosystems", Thomas Telford Publishing, 1997
5	Koerner, R. M., "Designing with geosynthetics", Prentice Hall Inc. 1998.
6	https://nptel.ac.in/courses/105108075

Course Plan

Course Title: Total Quality Management Lab	
Course Code: 231CEPECP303	Semester: V
Teaching Scheme: L-T-P: 0-0-2	Credits: 1
INT Marks: 25	ESE Marks: NA

Course Description:

This Lab course introduces the principles and techniques of Total Quality Management applied in Civil Engineering. Students will explore quality control tools, statistical methods, ISO standards, and quality audits with hands-on exercises and industry-based case studies.

Program Specific Outcomes (PSOs):

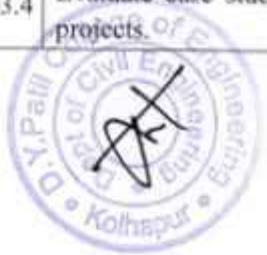
PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To familiarize students with TQM tools and techniques relevant to Construction practices.
2	To impart skills for implementing and auditing quality standards in civil engineering projects.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to…
CP303.1	Apply basic quality tools like Check Sheet, Histogram, Pareto Chart, and Fishbone Diagram in real-life civil projects.
CP303.2	Perform quality audits and interpret ISO 9001:2015 documentation.
CP303.3	Use Statistical Quality Control methods in concrete and road construction works.
CP303.4	Evaluate case studies of quality management in civil engineering infrastructure projects.



D.Y. PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP303.1	3	2	3	-	2	-	-	-	2	1	-	-	3	2	3
CP303.2	-	2	-	2	3	2	2	2	2	-	-	-	2	2	3
CP303.3	2	3	3	2	3	-	-	-	2	-	-	-	3	1	4
CP303.4	-	2	2	2	2	2	2	3	3	2	2	-	3	3	5

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Hours
1	Study of basic TQM concepts and quality philosophies (Deming, Juran)	2
2	Preparation and analysis of a Check Sheet for concrete batching plant	2
3	Pareto Analysis of defects in construction work	2
4	Cause-and-effect (Fishbone) Diagram for project delays	2
5	Histogram plotting of cube test results for quality monitoring	2
6	Statistical Quality Control using control charts (X-bar & R-chart)	2
7	ISO 9001:2015 structure and documentation – Mock Audit	2
8	Visit report on ISO-certified construction site	2
9	Quality Assurance Plan for a small civil engineering project	2
10	SWOT Analysis of a Civil Engineering company/project for strategic quality planning	2
11	Benchmarking study: Compare quality practices of two construction firms (desk research)	2
12	Role-play: Internal Quality Auditor and Management Review Team	2
13	Case study on implementation of TQM in highway construction	2
14	Role-play on customer satisfaction and feedback in civil services	2
15	Mini Project: Quality audit of an academic/lab process	2

Text Books:

1	Dale H. Besterfield, "Total Quality Management", Pearson Education
2	Subburaj Ramasamy, "Total Quality Management", McGraw Hill

Reference Books:

1	Juran, J.M. & Gryna, F.M., "Quality Planning and Analysis", Tata McGraw Hill
2	Kanishka Bedi, "Quality Management", Oxford University Press
3	Sharma D.D., "Total Quality Management", Sultan Chand & Sons

Codes:

1	ISO 9001:2015 – Quality Management Systems
2	IS 4926: Ready-Mixed Concrete
3	IS 10262: Concrete Mix Proportioning

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B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Basic Construction Materials (Online) **Platform:** NPTEL Swayam By Prof. Manu Santhanam, Prof. Radhakrishna G. Pillai, **IIT Madras**	
Course Code: 231CEMDML301	**Semester: V**
Teaching Scheme: L-T-P: 3-0-2	**Credits: 4**
ISE + MSE + INT Marks: 20 + 30 + 25	**ESE Marks: 50**

Course Description:

The course intends to provide basic information on the structure and properties of construction materials to undergraduate students. The contents of the course will focus on a fundamental understanding of the structure of common materials, the types of bonds, and mechanisms of damage and failure in materials. It will then introduce the different materials used in construction, with respect to the approached to their design and use. At the end of the course, the student should be able to link the material choice with the application in construction.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	To provide students with a fundamental understanding of the structure, properties, and applications of various engineering materials used in construction, including metals, ceramics, polymers, and composites.
2	To enable students to analyze and select appropriate materials for specific construction applications, considering factors such as strength, durability, cost, and environmental impact
3	To familiarize students with the behaviour of construction materials under different loading and environmental conditions, including deterioration processes and failure mechanisms.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to
MDML301.1	Describe the atomic structure and properties of common construction materials and relate these properties to their engineering applications.
MDML301.2	Evaluate and select suitable construction materials for specific design scenarios based on material properties and performance.
MDML301.3	Analyze the behavior of construction materials under various environmental conditions.

Prerequisite:	Basic Civil Engineering

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
MDML301.1	3	-	-	-	-	3	3	-	-	-	-	2	1	-	2
MDML301.2	3	-	-	-	-	-	3	1	-	-	-	2	2	-	2
MDML301.3	3	-	-	-	-	3	3	1	-	-	-	2	2	1	2

Content	Hours
Unit 1. Structure and Properties of Materials Fundamentals of material structure, from atomic bonding to failure theories; structure-property relationships; general engineering properties of materials	8
Unit 2. Stone / Brick / Mortar Properties and application of masonry materials; types of bonding; deterioration processes.	8

Unit 3. Cement and Concrete Cement composition and properties; properties of other ingredients; basic concrete mixture proportioning; Early age and long-term properties; construction methods with concrete	6
Unit 4. Steel / Aluminium / Copper Structure of iron and steel – phase diagrams; properties of reinforcing steel and structural steel; corrosion; properties and applications of Al and Cu Global and regional environmental issues of air pollution: Ozone depletion, Climate change, Global warming, Acid rain.	8
Unit 5. Composite materials / FRP / Polymers and Plastics Particulate and fibre reinforced composites; structure and behaviour of polymers and plastics **Wood / Glass** Structure of wood; processing of timber for construction; defects and deterioration of wood; properties and applications of glass	8
Unit 6. Pavement Materials Basic pavement materials such as WBM and WMM; structure and properties of asphalt; proportioning and application of bituminous concrete for flexible pavements; understanding of rigid pavements – jointed, doweled and continuously reinforced	7

LIST OF EXPERIMENTS /ACTIVITY

Experiment No.	Assignments / Experiment Name	Hours
1	Atomic Bonding and Material Properties	2
2	Failure Theories and Material Selection	2
3	Masonry Material Analysis	2
4	Bonding Patterns and Deterioration	2
5	Concrete Mixture Proportioning	2
6	Early Age and Long-Term Concrete Properties	2
7	Concrete Construction Methods	2
8	Phase Diagrams and Steel Properties	2
9	Corrosion Analysis and Prevention	2

10	Environmental Impact of Metal Production	2
11	Composite Material Design	2
12	Polymer and Plastic Properties	2
13	Wood Processing and Defects	2
14	Glass Applications in Modern Architecture	2
15	Pavement Design and Analysis	2

Text Books:

1	P.C. Varghese, "Building Materials," Prentice-Hall of India, New Delhi, 2008
2	Shan Somayaji, "Civil Engineering Materials," 2nd Edition, Prentice Hall, New Jersey, 2008

Reference Books:

1	Michael S. Mamlouk and John P. Zaniewski, "Materials for Civil and Construction Engineers," Addison Wesley Longman Inc., USA, 1999
2	William D. Callister, Jr., "Materials Science and Engineering – An Introduction," 3rd Ed., John Wiley and Sons, New York, 1994.

Web Link:

1	https://onlinecourses.nptel.ac.in/noc25_ce07/preview

Course Plan

Course Title: Smart Cities	
Course Code: 231CEOECL301	Semester: V
Teaching Scheme: L-T-P: 2-0-0	Credits: 2
ISE+MSE Marks: N.A.	ESE Marks: 50

Course Description:

The purpose of this course is to provide a deep understanding of the digital technologies, infrastructure and social political forces shaping the future of our urban environments. We begin by defining Smart Cities through lectures and studies and drill down into the technologies shaping new and existing cities.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To development entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1. To develop a basic understanding about various types of Infrastructure and Smart city
2. To enable the students to apply the basic need and planning concept to solve various Infrastructure problems.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to…
CL301.1	Understand the necessity of infrastructural development for smart cities.
CL301.2	Identify components of infrastructure and prepare infrastructure plan for smart city.
CL301.3	Understand smart transport system for smart cities and its application.
CL301.4	Study of water resources system for smart city and its application.

Prerequisite:	Understanding National and Global policies to implement for smart city development.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL301.1	3	-	-	-	-	1	-	-	-	-	-	1	-	-	2
CL301.2	3	-	2	-	-	1	-	-	-	-	-	1	-	1	2
CL301.3	3	-	2	-	-	1	-	-	-	-	-	1	-	1	2
CL301.4	3	-	-	-	-	1	-	-	-	-	-	1	-	-	2

Content	Hours
Unit 1. Fundamental of Smart City & Infrastructure: Introduction of Smart City, Concept of smart city, Objective for smart cities, Need to develop smart city, Challenges of managing infrastructure in India and world, various types of Infrastructure systems.	06
Unit 2. Planning and Development of Smart City Infrastructure: Solar energy for smart city, Housing, sustainable green building, safety, security, disaster management, cyber security, Project management.	08
Unit 3. Intelligent Transport System (ITS) Smart vehicles, GIS, GPS, ITS, Navigation system, traffic safety management, mobility services, E-ticketing.	08
Unit 4. Management of Water Resources and Policies for Smart Cities Storage and conveyance system of water, sustainable water and sanitation, sewerage system, flood management, conservation system. Government of India- policies for smart city, Mission statement & guidelines, Smart cities in India.	08

Text Books:

1	Infrastructure for smart cities by Dr R P Rethaliya Shree Hari Publications (1 January 2021)
2	Introduction to smart cities by Anil Kumar, Pearson India; First Edition (4 September 2019), ISBN-13: 978-9353439576

Reference Books:

1	Xianyi Li. "Smart City on Future Life - Scientific Planning and Construction"
2	Ben Green, 2019, The Smart Enough City: Putting Technology in Its Place to Reclaim Our Urban Future, MIT Press
3	Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities"
4	Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_3.12.2014_REVISED_AND_LATEST_.pdf).
5	Mission statement & guidelines on Smart City Scheme". Government of India - Ministry of Urban Development http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines (1).pdf

List of Open-Source Software/learning website:

1. Smart city government of India. http://smartcities.gov.in

2. Reconceptualising Smart Cities: A Reference Framework for India https://www.niti.gov.in/writereaddata/files/document_publication/CSTEP%20Report%20Smart%20Cities%20Framework.pdf

3. Draft Concept Note on Smart City Scheme. Government of India - Ministry of UrbanDevelopmentmartcitiesoftomorrow.com/wpcontent/uploads/2014/09/CONCEPT_NOTE_3.12.2014_REVISED_AND_LATEST_.pdf

Course Plan

Course Title: Geographic Information Systems	
Course Code: 231CEOECL302	Semester: V
Teaching Scheme: L-T-P: 2-0-0	Credits: 2
Evaluation Scheme: N.A.	ESE Marks: 50

Course Description:

This course includes advanced conceptual knowledge and understanding of fundamental principles of in Geographic Information Systems. It introduces the students to various types of data used in GIS and its applications. It also makes the student familiar with different kinds of software used in GIS field. After studying this course students will be equipped with enough technical knowledge and practical skill to pursue their professional career in the field of geographic information systems.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1. To understand concepts of Geographic information systems.
2. To Understand the various types of data used in GIS and its applications.
3. To understand integration of Remote sensing and GIS and preparation of DEMs.
4. To introduce the students to use and application of various types of GIS software.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to…
OECL302.1	Understand fundamental concepts of Geographic Information Systems.
OECL302.2	Understand and analyze various types of data in GIS.
OECL302.3	Integrate RS and GIS data and prepare digital elevation models.
OECL302.4	Understand and work with various types of GIS software.

Prerequisite:	Basic knowledge of Geography and physics

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL -
OECL302.1	3	3	3	-	3	-	-	-	-	-	-	-	1	1	2
OECL302.2	3	3	3	-	3	-	-	-	-	-	-	-	2	1	2
OECL302.3	3	3	3	-	3	-	-	-	-	-	-	-	2	1	2
OECL302.4	3	3	3	-	3	-	-	-	-	-	-	-	2	1	2

Content	Hours
Unit 1. Introduction to GIS Definition, concept and history of developments in the field of information systems Computer fundamentals for GIS, Hardware and software requirements for GIS, Coordinate system and projections in GIS – conic, cylindrical and planner	7

Unit 2. Data Structure and Types Data structure and formats, Spatial data models – raster and vector, data inputting & GIS, Spatial data analysis – significance and type, attribute query, spatial query, Vector based spatial data analysis, Raster based spatial data analysis - local, neighbourhood, regional and global operations	8
Unit 3. GIS Modelling Data quality and sources of errors, Integration of RS and GIS data, Digital elevation model and derivation of parameters, Data analysis and modeling in GIS– types of GIS modeling	7
Unit 4. GIS Software Open sources software, free software and cloud computing, Decision support systems, Overview of image processing & GIS Packages – ARC GIS, ERDAS, MAP INFO, ILWIS, GEOMEDIA, IDRISI, GRASS, SAGA, QGIS Recent trends in GIS – AM/FM, Virtual 3D GIS, Mobile GIS, OLAP, Internet GIS, Open GIS	8

Text Books:

1	Chang. T.K. (2002): Geographic Information Systems. Tata McGraw Hill
2	Ram Mohan Rao. (2002): Geographical Information Systems. Rawat Publication
3	Heywood. I, Cornelius S, Crver Steve. (2003): An Introduction to Geographical Information Systems. Pearson Education.

Reference Books:

1	Anji Reddy, M. (2004): Geoinformatics for Environmental Management. B.S. Publications
2	Tar Bernhardsen. Geographical Information Systems. John Wiley
3	Michael N. Demers : Fundamentals of Geographic Information Systems: John Wiley and Sons, Inc.

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KOLHAPUR-416006 (An Autonomous Institute)

B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-V (Academic Year 2025-26)

Course Plan

Course Title: Environmental Impact Assessment (EIA)	
Course Code: 231CEOECL303	**Semester: V**
Teaching Scheme: L-T-P: 2-0-0	**Credits: 2**
ISE + MSE Marks: N.A.	**ESE Marks: 50**

Course Description:

One of the basic tools for Environmental Management System is Environmental Impact Assessment (EIA) report. It is mandatory for all developmental projects to go for Environmental clearance. The course focuses on need for EIA, history, legal aspects, process of EIA, Post Project Monitoring and Environmental Management Plan for various sectors of Engineering.

Program Specific Outcomes (PSOs):

PSO1	To impart interdisciplinary knowledge and skills for enhancing employability
PSO2	To develop abilities in graduates to suit to the requirements of the varied industry

Course Objectives:

1	To explain the concept of Environmental Impact Assessment (EIA) as an Environmental Management tool.
2	To describe legal aspects of EIA.
3	To prepare EIA report.
4	To prepare Environmental Management System (EMS) for particular industry related with Civil Engineering

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
OECL303.1	Explain the concept of EIA and elements of EIA
OECL303.2	Describe legal aspects of EIA and notifications.
OECL303.3	Prepare Environmental Management System (EMS) for particular industry related with Civil Engineering

Prerequisite:	Environmental Studies

Course Articulation Matrix

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
OECL303.1	2	2	-	-	-	1	1	-	-	-	-	1	1	1	2
OECL303.2	2	2	1	-	1	3	1	2	-	-	-	1	1	1	2
OECL303.3	2	2	3	-	3	3	2	2	1	1	1	1	1	1	2

Content	Hours
Unit 1. Introduction EIA Necessity and brief description of EIA. Steps in EIA process Case Study Categories for EIA study Environmental Impact Statement (EIS)	7
Unit 2. Legal Aspects of EIA- Notifications Evolution of EIA in India Notification 1994 Notification 2006 Draft notification 2020 Amendments Environmental Clearance	7

Unit 3. Environmental Management Planning EIA report- Steps Post project monitoring (PPM) Life Cycle Assessment Case Study	8
Unit 4. Environmental Management System (EMS) Environmental Management Plan Steps in EMS Environmental Audit CER (Corporate Environmental Responsibility) and CSR (Corporate Social Responsibility) Case Study	8

Text Books

1	Environmental Impact Assessment, Larry W. Canter, McGraw-Hill International Editions.
2	Ecology and Environmental Studies, S. K. Garg, Khanna Publishers.

Reference Books

1	Handbook of Environmental Laws, Acts, Guidelines, Compliances and Standards, Volume-I & II, R K Trivedi, B S Publications.
2	A Handbook on Environmental Impact Assessment, Prepared for SNH by David Tyldesley and Associates, Edinburgh

Course Plan

Course Title: Design of Steel Structures	
Course Code: 231CEPCCL304	Semester: VI
Teaching Scheme: L-T-P: 3-0-0	Credits: 3
ISE + MSE Marks: 20 + 30	ESE Marks: 50

Course Description:

This course contains the design of structural steel members and relates design specifications to the basic behavior of structures which shows students how specifications and codes are used in the solution of design problems. Topics include design philosophies, loads, analysis and design of bolted and welded connections, design of tension and compression members, columns and column bases, design of beams and composite beams.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1. To familiarize students with the Limit State Design (LSD) approach as per IS 800:2007.
2. To apply design principles for various steel elements as per 800:2007design guidelines.
3. To evaluate and ensure structural safety, strength, and serviceability of these elements.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to…
CL304.1	Understand behavior of Steel to interpret and apply IS 800:2007 design provisions for steel structures.
CL304.2	Analyze and design axially loaded bolted & welded connections.
CL304.3	Analyze and Design Tension and Compression Members
CL304.4	Design laterally supported beams with moment capacity and shear strength criteria.

Prerequisite:	Mechanics of Structures, Structural Analysis

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POS/ COS	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL304.1	3	3	-	2	-	-	-	3	-	-	-	2	1	-	2
CL304.2	3	3	3	-	-	-	-	3	-	-	-	2	3	1	4
CL304.3	3	3	3	-	-	-	-	3	-	-	-	2	3	1	4
CL304.4	3	3	3	-	-	-	-	3	-	-	-	2	3	1	4

Content	Hours
Unit 1. Introduction: Advantages and disadvantages of steel structures, types of steel structures, Design Philosophy, grades of structural steel, loads and load combinations, partial safety factors for load and materials for steel structures.	5

Unit 2. Connections: Types, advantages & disadvantages, Analysis and Design of axially loaded bolted and welded connections.	8
Unit 3. Tension Members: Common sections, Net area, modes of failure, load carrying capacity. Design of tension members.	10
Unit 4. Compression Members: As Struts - Common sections, economical sections, effective length, slenderness ratio, modes of failure, classification of cross section, behavior of compression member, load carrying capacity, Design of compression members (only single and double angle.)	6
Unit 5. Column and Column Bases: Design of column subjected to axial loading, design of lacing, battening system, column splices. **Column Bases:** Design of slab base & gusseted base subjected to axial loading, Design of concrete pedestal (dimensions only)	10
Unit 6. Beam in Flexure – Types of sections, behavior, design of laterally supported Beams, rolled sections, built up beams, Design for strength and serviceability. Web buckling & web crippling.	6

Text Books:

1	Limit State Design of Steel Structures - Duggal S.K., Tata McGraw-Hill Education private Ltd., New Delhi, 2nd Edition 2014
2	Design of Steel Structures: By Limit State Method as Per IS: 800 – 2007 - Bhavikatti S. S., I K International Publishing House.
3	Limit State Design in Structural Steel - Shiyekar M. R, 2nd Edition, PHI Publisher
4	Design of Steel Structures, N. Subramanian: Oxford University Press
5	Limit State Design of Steel Structures Ramachandra and Virendra Gehlot Scientific Publishers

Reference Books:

1	LRFD Steel Design - William T. Segui, PWS Publishing
2	Design of Steel Structures - Edwin H. Gaylord, Charles N. Gaylord James, Stallmeyer, Mc-Graw Hill
3	Steel Structures: Design and Practice, N. Krishna Raju, Universities Press
4	Design of Steel Structures - Kazimi S. M. and Jindal R. S., Prentice Hall India.
5	Design of Steel Structures, N. Subramanian. Oxford University Press
6	Design of Steel Structures, K.S. Sai Ram, Publisher: Pearson Education

I. S. Codes:

1. IS: 800 – 2007
2. IS: 875 (part I, II and III)
3. SP6 (1) & SP 6 (6)
4. IS: 816
5. IS: 808.

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B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Estimation & Valuation	
Course Code: 231CEPCCL305	**Semester: VI**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description: This course introduces students to the process of estimating in a construction management environment. Students learn how to cost estimate materials, labour, and other costs for construction projects. Also learn about valuation of land and building.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To know the importance of estimation in civil engineering works.
2	To study about the specification writing & prepare rate analysis of various items.
3	To carry out the estimation for various civil engineering structures.
4	To understand the valuation of civil engineering structures.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL305.1	Explain the importance of estimation in civil engineering works.
CL305.2	Prepare specification of items of works and analyse the rates for different items of works.
CL305.3	Illustrate the detailed estimation for various construction projects.
CL305.4	Interpret fundamental concepts of valuation.

Prerequisite:	The students must have more knowledge about basic fundamentals of mathematics, building construction materials and building structure components with designing.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL305.1	2	1	-	-	-	-	-	-	-	-	-	1	-	-	2
CL305.2	3	2	2	-	1	-	-	-	-	-	-	1	-	-	3
CL305.3	3	3	2	-	2	2	-	-	2	-	2	3	1	2	3
CL305.4	2	2	-	-	-	-	-	-	1	-	-	2	-	2	3

Content	Hours
Unit 1: Introduction to Quantity Surveying a) Introduction to quantity surveying and its importance: Definition of Estimation, Purpose of estimates, Types of estimates - Detailed estimates & approximate estimates, Various items to be included in estimates. b) Approximate estimation: methods for building & other civil engineering projects like roads, irrigation/ water supply, sanitary engineering, industrial sheds etc. c) Principles in selecting units of measurement for items, Units of measurement for various items of work and Rules for measurements as per BIS: 1200, administrative approval & technical sanction of estimates, introduction to D.S.R.	7

Unit 2: Specifications & Rate Analysis a) Specifications: Definition & purpose, basic principle of general and detailed specifications (writing the detailed specification for various Constructions should be covered in term work such as materials, quality, workmanship, method of execution, mode of measurement and payment for major items like excavation, stone/ brick masonry, plastering, ceramic tile flooring, R.C.C. work etc.) b) Rate Analysis: Definition, materials, sundries, labour, tools & plant, overheads & profit. Task work or out turn, factors affecting the cost of materials, price escalation.	8
Unit 3: Methods of Estimation Measurement and abstract sheets and recordings, taking out quantity methods – Long wall- short wall method (PWD Method) & Centre line method. Calculation of quantities for Load bearing and R.C.C framed structures.	8
Unit 4: Estimation & Bar Bending Schedule a) Detailed estimate of building, R.C.C. Works, culverts, earthwork for canals, Roads including hill roads and other civil engineering works. b) Preparation of schedule for steel as reinforcement (Bar Bending Schedules) c) Introduction of the various software used in quantity surveying.	8
Unit 5: Valuation a) Valuation- Definition and Principles of valuation, Purposes. Definition of value, price & cost, Attributes of value, Different types of values. b) Values and his duties, factors affecting the valuation of properties, Tangible and Intangible properties, Concept of Landed properties – freehold and leasehold properties, Different types of leases. c) Valuation from yield and from life, Gross income and Net income, Outgoings, Capitalized value, Year's purchase – single rate and dual rate, reversion value of land	7
Unit 6: Valuation Methods a) Methods of valuation - Rental method of valuation, direct comparison with capital value, valuation based on profit, valuation based on cost, Development method of valuation. b) Depreciation – Methods of depreciation: Straight line method, Constant percentage method, Sinking fund method and Quantity survey method. c) Obsolescence.	7

Text Books:

1	M. Chakraborty, "Estimating, Costing Specifications & valuation in Civil Engineering"
2	Dutta B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003.
3	S. C. Rangwala, "Estimating and Costing", Charotar Publ. House, Anand.
4	B. S. Patil, "Civil Engineering, Contracts and Estimates", Universities Press Private Ltd., Hyderabad.
5	S. C. Rangwala, "Valuation of Real properties", Charotar Publ. House, Anand.
6	G. S. Birdie, "A text book of Estimating & Costing", Dhanpat Rai & Sons.

Reference Books:

1	Roshan Nanavati, "Professional Practice (Estimating and Valuation)", (1984 Edition) U.B.S. Publishers, Distributers PVT. Ltd.5 Ansari Road, New Delhi.
2	Standard specifications Volumes I & II (P. W. D. Maharashtra) Govt. of Maharashtra.
3	C.P.W.D. specifications.
4	C.P.W.D. schedules of rates.

Codes:

1	IS 1200 (Part 1 to 25): Methods of Measurement of Building & Civil Engineering Works.
2	IS 3861-1966: Method of Measurement of Areas and Cubical Contents of buildings.
3	S. S. R. (State Schedule of Rates) for current year.
4	PWD Redbooks, Vol 1 & 2.
	e – Resources: nptel.iitm.ac.in

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B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Fluid Mechanics	
Course Code: 231CEPCCL305	**Semester: VI**
Teaching Scheme: L-T-P: 2-0-0	**Credits: 2**
ISE + MSE Marks: N.A.	**ESE Marks: 50**

Course Description:

The material in this course will provide the student with a fundamental background in the statics and dynamics of fluids, laws of fluid mechanics and energy relationships. The basic conservation laws of mass, momentum and energy are analysed in control volume and differential form. The student will learn how to choose the right formulation for fluid flow problems. The student will also learn how to analyse practical fluid flow phenomenon and apply basic principles / concepts in fluid mechanics to solve real life situations.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	To study processes and science of fluid and their properties
2	To study pressure measuring devices and pressure diagram.
3	To apply basic principles in fluid flow problems.
4	To identify the losses in pipes.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL305.1	Apply the basic properties of fluids and their behaviour to various force systems
CL305.2	Apply the basic concepts and principles in fluid statics, fluid kinematics and fluid dynamics with their applications in fluid flow problems.
CL305.3	Apply the principles of continuity, momentum and energy as applied to fluid in motion.
CL305.4	Apply the equations to analyse problems by making proper assumptions and learn systematic engineering methods to solve practical fluid mechanics problems.

Prerequisite:	Engineering Physics, Fundamentals of Civil Engineering and Engineering Mechanics

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL305.1	3	2	-	-	1	-	-	-	-	-	-	-	-	-	3
CL305.2	3	2	1	-	1	-	-	-	-	-	-	-	-	-	3
CL305.3	3	2	1	-	-	-	-	-	-	-	-	1	2	-	3
CL305.4	3	2	2	-	-	-	-	-	-	-	-	1	2	2	3

Content	Hours
Unit 1. Fluid Properties and Pressure Measurements **Physical Properties of fluid:** Specific gravity, Viscosity, Surface tension, vapour pressure and their influence on fluid at rest and in motion **Floatation and Buoyancy:** Pascal's Law, Hydrostatic Law, Stability of Floating and submerged objects, Determination of Metacentric height of floating objects	8
Unit 2. Fluid Kinematics and Similitude, Fluid Dynamics **Fluid Kinematics:** Types of Flow, Continuity Equation, Flow net Dimensional Analysis and Model studies: Buckingham Pie Theorem, Non-Dimensional numbers and their significance. **Fluid Dynamics:** Euler's and Bernoulli's equations along a streamline, Momentum equation applied to forces on pipe bends	9

Unit 3. Boundary Layer Theory **Boundary Layer Theory:** Concept, B.L. along a thin plate, Separation of B.L. and its control, flow around submerged objects, Drag and Lift. **Laminar and Turbulent Flow:** Reynold's Experiment, Velocity Distribution, Hazen Poiseuille's Equation.	7
Unit 4. Losses in Pipe Flow **Flow through Pipes:** Major and Minor losses, Darcy Weisbach Equation, Pipes in series, pipes in parallel, Two reservoir problems, Pipe network, Water hammer in pipes.	6

Text Books:

1	A.K. Jain -Fluid Mechanics — Khanna Pub., Delhi.
2	Modi/Seth – Hydraulic and Hydraulic Machines — Standard Book House, Delhi

Reference Books:

1	Streeter -Fluid Mechanics -McGraw-Hill International Book Co., Auckland.
2	V. T. Chaw - Flow in open channel –McGraw-Hill International Book Co., Auckland.
3	K. L. Kumar -Fluid Mechanics — Eurasia Publication House, Delhi.
4	Shames - Fluid Mechanics - McGraw-Hill International Book Co., Auckland.
5	Rangaraju -Open Channel flow– Tata McGraw-Hill Pub. Co., Delhi.
6	R.K. Bansal -Fluid Mechanics and hydraulic machine-, Laxmi Pubication

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Third Year B. Tech. Civil Engineering

SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Design of Steel Structures Lab	
Course Code: 231CEPCCP304	**Semester: VI**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: 25**

Course Description:

The Design of Steel Structures Laboratory is a practical course that complements the theoretical concepts taught in the Design of Steel Structures subject. It focuses on hands-on experience in designing, analyzing, steel structural components as per IS 800:2007 and other relevant Indian Standards.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1. To provide practical exposure to the design and behavior of steel structural elements.
2. To enable students to design tension members, compression members, beams, columns, and connections.
3. To develop skills in fabrication techniques such as bolting and welding.

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Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to...
CP304.1	Apply IS 800:2007 principles to design tension members, compression members, beams, and columns.
CP304.2	Analyze and design axially loaded bolted & welded connections.
CP304.3	Prepare the working drawing as per requirement of project
CP304.4	Utilize tools like **STAAD.Pro or ETABS** for modeling, analysis, and optimization of steel structures.

Prerequisite:	Mechanics of Structures, Structural Analysis

Course Articulation Matrix:

Mapping of Course Outcomes (Cos) with Program Outcomes (Pos) and Program Specific Outcomes (PSOs)

Pos/ Cos	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL304.1	3	3	-	2	-	-	-	3	2	-	-	2	1	-	2
CL304.2	3	3	3	2	-	-	-	3	2	-	-	2	3	1	4
CL304.3	3	3	3	2	-	-	-	3	2	-	-	2	3	1	4
CL304.4	3	3	3	2	3	-	-	3	2	-	-	2	3	1	4

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LIST OF EXPERIMENTS

Experiment No.	Name of Experiment	Hours
Project-1	**Design of Industrial Building**	
1	Problem statement, preparation of Structural Layout Plan Design of Roof truss, Configuration of Truss	2
2	Dead Load, Live Load and Wind Load calculations on truss	2
3	Graphical Analysis of Dead Load, Live Load and Wind Load on roof truss	2
4	Load combinations & calculations of design forces in various members	2
5	Design of Tension Members - Tie member & sling	2
6	Design of Compression Members - Principal rafter & strut	2
7	Design of typical connections	2
8	Design of column, Design of column base plate & slab base	2
9	Design of Purlin	2
10	Detail working drawing - Truss Elevation and Typical Connections	2
Project-2	**Analysis and Design of Building Frame**	
11	Preparation of Layout plan for beams & load calculations	2
12	Design of end and intermediate sub beams	2
13	Design of end and intermediate main beams	2
14	Design of typical connections - Beam to beam, beam to column connections	2
15	Preparation of Working Drawings - Lay out Plans, detail connections	2
	* **Note:** Conduct workshop on "Analysis and Design of Structural Steel Element" by using any application software.	

Text Books:

1	Limit State Design of Steel Structures - Duggal S.K., Tata McGraw-Hill Education private Ltd., New Delhi, 2nd Edition 2014
2	Design of Steel Structures: By Limit State Method as Per IS: 800 – 2007 - Bhavikatti S. S., I K International Publishing House.
3	Limit State Design in Structural Steel - Shiyekar M. R, 2nd Edition, PHI Publisher
4	Design of Steel Structures, N. Subramanian: Oxford University Press
5	Limit State Design of Steel Structures Ramachandra and Virendra Gehlot Scientific Publishers

Reference Books:

1	LRFD Steel Design - William T. Segui, PWS Publishing
2	Design of Steel Structures - Edwin H. Gaylord, Charles N. Gaylord James, Stallmeyer, Mc-Graw Hill
3	Steel Structures: Design and Practice, N. Krishna Raju, Universities Press
4	Design of Steel Structures - Kazimi S. M. and Jindal R. S., Prentice Hall India.
5	Design of Steel Structures, N. Subramanian Oxford University Press
6	Design of Steel Structures, K.S. Sai Ram, Publisher: Pearson Education

I.S. Codes:

1. IS: 800 – 2007
2. IS: 875 (part I, II and III)
3. SP6 (1) & SP 6 (6)
4. IS: 816
5. IS: 808.

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B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Estimation and Valuation Lab	
Course Code: 231CEPCCP305	**Semester: VI**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: 25**

Course Description: This course introduces students to the process of estimating in a construction management environment. Students learn how to cost estimate materials, labour, and other costs for construction projects. Also learn about valuation of land and building.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1. To know the importance of estimation in civil engineering works.
2. To study about the specification writing & prepare rate analysis of various items.
3. To carry out the estimation for various civil engineering structures.
4. To understand the valuation of civil engineering Structures.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP305.1	Explain the importance of estimation in civil engineering works.
CP305.2	Prepare specification of items of works and analyse the rates for different items of works.
CP305.3	Illustrate a detailed estimation for various construction projects.
CP305.4	Interpret fundamental concepts of valuation.

Prerequisite:	The students must have more knowledge about basic fundamentals of mathematics, building construction materials and building structure components with designing.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP305.1	2	1	-	-	-	-	-	-	-	-	-	1	-	-	2
CP305.2	3	2	2	-	1	-	-	-	-	-	-	1	-	-	3
CP305.3	3	3	2	-	2	2	-	-	2	-	2	3	1	2	3
CP305.4	2	2	-	-	-	-	-	-	1	-	-	2	-	2	3

LIST OF EXPERIMENTS

Activity No.	Name of Activity	Type	Hours
1	Drafting detailed specifications for minimum seven civil engineering items from buildings.	S	2
2	Drafting one detailed specification each from Roads, Water Supply & Sanitation for civil engineering items.	S	2
3	Analysing rate analysis of seven civil engineering items based on prevailing market rates.	S	2
4	Prepare excel sheet of rate analysis for minimum 5 items of works.	S	2
5	Detailed estimate of Substructure items of residential framed structure using D.S.R.	O	2
6	Detailed estimate of Ground Floor of residential framed structure using D.S.R.	O	2
7	Detailed estimate of First Floor of residential framed structure using D.S.R.	O	2
8	Preparing detailed estimate for any one of the following: a) A stretch of a road about 1 Km. long including earthwork. b) A reach of canal about 1 Km. long. c) A factory shed of steel frame. d) Underground Water Tank.	S	2
9	Work out quantities of steel reinforcement for a column footing by preparing bar bending schedule.	O	2

10	Work out quantities of steel reinforcement for a column by preparing bar bending schedule.	O	2
11	Work out quantities of steel reinforcement for a beam by preparing bar bending schedule.	O	2
12	Work out quantities of steel reinforcement for a slab by preparing bar bending schedule.	O	2
13	Work out quantities of steel reinforcement for a staircase by preparing bar bending schedule.	O	2
14	Valuation reports for building of residential purpose or commercial purpose	S	2
15	Prepare the detailed estimation of small residential building by using estimation software.	O	2

Type: S- Study, **O-** Operational

Text Books:

1	M. Chakraborty, "Estimating, Costing Specifications & valuation in Civil Engineering".
2	Dutta B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003.
3	S. C. Rangwala, "Estimating and Costing", Charotar Publ. House, Anand
4	B. S. Patil., "Civil Engineering, Contracts and Estimates", Universities Press Private Ltd., Hyderabad.
5	S. C. Rangwala, "Valuation of Real properties", Charotar Publ. House, Anand
6	G. S. Birdie, "A text book of Estimating & Costing", Dhanpat Rai & Sons.

Reference Books:

1	Roshan Nanavati, "Professional Practice (Estimating and Valuation)", (1984 Edition) U.B.S. Publishers, Distributers PVT. Ltd.5 Ansari Road, New Delhi.
2	Standard specifications Volumes I & II (P. W. D. Maharashtra) Govt. of Maharashtra.
3	C.P.W.D. specifications.
4	C.P.W.D. schedules of rates.

Codes:

1	IS 1200 (Part 1 to 25): Methods of Measurement of Building & Civil Engineering Works.
2	IS 3861-1966: Method of Measurement of Areas and Cubical Contents of buildings.
3	S. S. R. (State Schedule of Rates)) for current year.
4	PWD Redbooks, Vol 1 & 2.

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B. Tech. Curriculum as per NEP-2020
Third Year B. Tech. Civil Engineering
SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Advanced Structural Analysis	
Course Code: 231CEPCEL304	**Semester: VI**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:
Advanced Structural analysis is offered as core course at the first semester of Civil Structural Engineering post graduate program. This course focuses on basic concept and different analytical tools for understanding the behavior of especially of statically indeterminate structures. This course divided into four modules. The first module contains influence line diagram for cantilever, fixed, continuous beams, portal frames and arches. The Second module focuses on analysis beams curved in plan and Beam-Columns. The module three includes member oriented and structure-oriented stiffness and flexibility matrix methods. Module four contains Boundary value problems This course intends to build the competency in the students to identify indeterminate arches and portal structures, and to analyze the structures like fixed beam, continuous beam, frames. Also advanced topic such as beams curved in plan, beam-column analysis, matrix methods of analysis of structures and solution of boundary value problems

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	To develop ILD for reactions, S.F. and B.M. for indeterminate structures. Construct SFD, BMD and TMD for beams curved in plan for various loading and support condition.
2	To analyse the beam-column structures
3	To analyse the structures by using the stiffness & flexibility matrix method.
4	To solve boundary value problems from civil engineering.

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Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to…
CEL304.1	Construct of ILD for reactions, S.F. and B.M. for indeterminate structures
CEL304.2	Draw SFD, BMD and TMD for beams curved in plan for various loading and support condition
CEL304.3	Analyse the beam-column structures and analyse the structures by using the stiffness & flexibility matrix method.
CEL304.4	Solve boundary value problems from civil engineering.

Prerequisite:	Analysis of determinate and indeterminate structures

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CEL304.1	2	3	3	3	-	3	-	-	-	-	-	2	-	2	3
CEL304.2	2	3	3	3	-	3	-	-	-	-	-	2	-	2	3
CEL304.3	3	3	3	3	-	3	-	-	-	-	-	2	2	-	3
CEL304.4	3	3	3	3	-	3	-	-	-	-	-	2	2	2	3

Content	Hours
Unit 1. Influence Lines Single concentrated load – Uniformly distributed load – Two concentrated loads – Curves of maximum Bending Moment diagram and Shear Force Diagram– Equivalent Uniformly Distributed Load – Influence line for statically determinate beams for bending moment and shear force due to concentrated and uniformly distributed loads Physical Significance, Muller Breslau's Principle, Moment distribution method, ILD for propped cantilever, fixed beams.	8

Unit 2. Beams Curved in Plan Analysis of determinate and indeterminate beams curved in plan such as cantilever circular arch, semicircular beams fixed at two ends subjected to point load and udl, simply supported semicircular beams, circular ring beam.	8
Unit 3. Beam Columns Governing differential equation, geometric and material nonlinearity, Analysis of beam- columns simply and fixed supported at ends with concentrated load, moment and uniformly distributed load, magnification factor	7
Unit 4. Stiffness Matrix Method Stiffness coefficients, Development of stiffness matrix, Equilibrium equations, Applications to beams and portals (Degree of K.I. ≤ 2)	7
Unit 5. Flexibility Matrix Method Flexibility coefficients, Development of flexibility matrix, Compatibility equations, Application to propped cantilever, fixed beam, continuous beam (Degree of S.I. ≤ 2)	7
Unit 6. Boundary Value Problems Approximate solution of boundary value problems, Modified Galerkin Method for one-dimensional BVP, Matrix formulation of the Modified Galerkin Method	8

Text Books:

1	Vazirani and Ratwani, "Advanced Theory of Structures & Matrix method", Khanna Publisher, Delhi.
2	Reddy C.S., "Basic structural Analysis", Tata McGraw Hill, Delhi.

Reference Books:

1	Timoshenko and Gere, "Strength of Materials", East West Press Ltd.
2	Gere and Weaver, "Matrix Analysis of Framed Structures", CBS Publishing, Delhi.
3	Pandit & Gupta, "Structural Analysis - A matrix approach", Tata McGraw Hill, Delhi.
4	Negi and Jangid, "Structural Analysis", Tata McGraw Hill Pub. Co. Delhi
5	N. Krishnaraju and D.R. Gururaja, "Advanced Mechanics of Solids & Structures", Narosa Pub. House Delhi.
6	Lewis P. E. and Ward J. P., "The Finite Element Method", Addison-Wesley Pub. Co.

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B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Railway and Tunnel Engineering	
Course Code: 231CEPECL305	**Semester: VI**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

It is the branch of Civil engineering deals with planning, design, construction, operation-maintenance of facilities providing for the railway and tunnel Engineering.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To introduce the fundamentals and advances in the area of railway Engineering.
2	To Understand Fundamentals and purpose of tunnels.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL305.1	Apply knowledge of railway track components, materials, fixtures to design and maintain efficient railway infrastructure.
CL305.2	Solve problems related to railway track geometry, train resistance, and the design of points and crossings.
CL305.3	Understand signalling and control systems, including recent advancements in railway engineering.
CL305.4	Study various component parts of tunnel and concept of tunnelling methods.

Prerequisite:	Transportation Engineering

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL305.1	3	-	-	-	-	3	-	-	-	-	-	3	1	-	2
CL305.2	3	2	2	-	-	3	-	-	-	-	-	2	1	-	3
CL305.3	3	-	-	-	-	-	-	-	-	-	-	3	1	-	2
CL305.4	3	-	-	-	-	-	-	-	-	-	-	2	1	-	2

Content	Hours
Unit 1. Introduction to Railway Engineering Development of railways in India - Components of a permanent way and its functions - Rails, Gauges and its selection, Sleepers, Ballast, Formation, Rail fittings and fastenings - Coning of wheels Defects in rails: creep and shift in rails	6
Unit 2. Geometric Design Geometric design: Alignment, gradient, horizontal curves, super elevation, design problems on above. Points & Crossing: Terms used, standard points and crossings, Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Design of simple turnout.	8
Unit 3. Railway Stations and Signalling Railway stations: requirements, facilities, classifications, platforms, and types of yards. Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system, System for Controlling Train Movement –Interlocking, Anti Collision Device Modernization of railways- Metro rail, mono rail, Bullet Train, High Speed Train	7

Unit 4. Tunnel Engineering General, advantages and disadvantages of tunnelling, Advantages and disadvantages of open cuts, Classification of tunnels, Shapes of tunnels, Comparison of bypassing Alternative s Tunnel, Open cut, bridge and surface road, Size of tunnels, Problems in tunnelling.	6
Unit 5. Alignment of Tunnel Alignment of a tunnel, Alignment restraints, Environmental considerations Investigations for tunnel site –Geotechnical Exploration in Tunnelling, Investigations before planning, Investigations at the time of planning, Investigations at the time of construction. Setting out of tunnel - Setting out tunnel on ground surface, Transfer of centre line from surface to underground, Underground setting out, Underground levelling	7
Unit 6. Tunnelling Methods Tunneling Methods-Types and purpose of tunnels; factors affecting choice of excavation technique; Methods –soft ground tunneling, hard rock tunneling, Tunnel lining. Introduction of lighting, ventilation and drainage in tunnel.	8

Text Books:

1	Arora, S. P. and Saxena, S. C, "A Textbook on Railway Engineering", Dhanpat Rai Publications (P) Ltd., New Delhi
2	R. Srinivasan, "Harbour, Dock and Tunnel Engineering" Charotar Publishing House Pvt. Ltd.

Reference Books:

1	M M Agarwal, "Railway Works Engineering", Prabha& Co. Delhi
2	Chandra Satish and Agrawal M.M., "Railway Engineering", ISBN: 978-0198083535, Oxford University Press, New Delhi.
3	Asheesh Kumar "Tunnel Engineering" Vayu Education of India
4	Subash C. Saxena "Tunnel Engineering" Dhanpat Rai Publications (P) Ltd.

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B. Tech. Curriculum as per NEP-2020

Third Year B. Tech. Civil Engineering

SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Solid and Hazardous Waste Management	
Course Code: 231CEPECL306	**Semester: VI**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

This course provides a comprehensive overview of the principles and practices of solid and hazardous waste management, addressing the growing challenges of waste generation and disposal in modern society. It explores the entire lifecycle of solid waste, from generation and collection to treatment and final disposal, with a focus on sustainable and environmentally sound practices.

Program Specific Outcomes (PSOs):

PSO1	To impart interdisciplinary knowledge and skills for enhancing employability
PSO2	To develop abilities in graduates to suit to the requirements of the varied industry

Course Objectives:

1	To provide knowledge of Solid waste management
2	To provide knowledge of biomedical and Hazardous Wastes generation and management.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL306.1	Know the functional elements of solid waste with management.
CL306.2	Know biomedical and Hazardous Wastes management.
CL306.3	Have knowledge for solving and communication skills to specific problems in order to practice the role of health and safety professionals in managing hazardous materials and wastes.
CL306.4	Understand fundamental principles of existing and emerging technologies for the treatment of waste and recovery of value from waste.

Prerequisite:	Environmental Studies, Environmental Engineering.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL306.1	2	2	-	-	-	1	1	-	-	2	-	-	1	1	2
CL306.2	2	2	1	-	1	2	1	-	-	2	-	-	1	1	2
CL306.3	2	2	3	-	3	3	2	-	-	1	-	-	1	1	2
CL306.4	2	2	3	-	3	3	2	-	-	1	-	-	1	1	2

Content	Hours
Unit 1: Introduction to Solid Waste Management Solid waste management: Objectives, Functional elements, Environmental impact of mismanagement. Solid waste: Sources, Types, Composition, Quantities, Physical, Chemical and Biological properties. Indian scenario.	7
Unit 2: Solid Waste Generation, Collection, Storage, Transfer and Transport Solid waste generation rate: Definition, Typical values for Indian cities, Factors affecting. Storage and collection: General considerations for waste storage at source, Types of collection systems. Transfer station: Meaning, Necessity, Location, Economic analysis. Transportation of solid waste: Means and methods, Routing of vehicles.	7

Unit 3: Sorting and Material Recovery Sorting and material recovery: Objectives, Stages of sorting, Sorting operations, Guidelines for sorting for material recovery, Typical material recovery facility for a commingled solid waste. Waste Processing – Objectives, Unit operations for component separation, material separation and processing technologies.	7
Unit 4: Solid Waste Treatment Composting of solid waste: Principles, Methods, Factors affecting, Properties of compost, Vermicomposting. Energy recovery from solid waste: Parameters affecting, Biomethanation, Fundamentals of thermal processing, Pyrolysis, Incineration, Advantages and disadvantages of various technological options. Landfills: Definition, Essential components, Site selection, Land filling methods, Leachate and landfill gas management.	8
Unit 5: Biomedical Waste Biomedical Waste: Generation, identification, storage, collection, transport, treatment, common treatment and disposal, occupational hazards and safety measures. Biomedical waste legislation in India.	8
Unit 6: Hazardous Wastes Definition and identification of Hazardous Wastes, Sources and Characteristics of hazardous wastes, Hazardous waste regulations and legislations, Handling and storage of Hazardous wastes, Hazardous Waste Treatment technologies, Physical, chemical & thermal methods of stabilizations, Incineration of Hazardous waste landfills, Reclamation of Hazardous waste landfill sites. Radioactive waste management. E-waste management.	8

Text Books:

1	Bhide, A. D. and Sundaresan, B. B. (2001). Solid Waste Management – Collection, Processing and disposal. Mudrashilpa offset printers, Nagpur.
2	T. V. Ramachandra, Municipal Solid Waste Management, Published by Common Wealth of Learning, Canada; Centre for Ecological Sciences, IISc, Karnataka Environment Research Foundation
3	Tchobanoglous, G., Theisen and Vigil, Integrated Solid Waste Management: Engineering Principles and Management Issues, McGraw Hill, 1993
4	Peavy, H. S., Rowe, D. R. and Tchobanoglous, G. (1985) Environmental Engineering, McGraw-Hill Book Company, Singapore

Reference Books:

1	Municipal Solid Wastes (Management and Handling) Rules, 2000.Ministry of Environment and Forests Notification, New Delhi, the 25th September, 2000. Amendment – 1357(E) – 08-04-2016
2	Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Central Public Health and Environmental Engineering Organization (CPHEEO), 2016, Ministry of Urban Development, Government of India.
3	George Tchobanoglous, Frank Kreith , Handbook of Solid waste management, second edition, published by M/c Graw hill Education, 2002, ISBN-13 9780071356237 ISBN -10 0071356231

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SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Earthquake Engineering	
Course Code: 231CEPECL307	**Semester: VI**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:
Course is comprised of basic concepts of earthquake engineering, vibration analysis, EQ resistant design, masonry structures etc. Course also include modern earthquake resisting techniques.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To study basic concepts of Earthquake Engineering
2	To prepare mathematical modelling and do the seismic analysis.
3	To understand dynamic behaviour of structure.
4	To study design concepts with advance EQ resistant techniques.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
PECL307.1	Understand the information of fundamental knowledge of EQ engineering.
PECL307.2	Apply vibration and seismic analysis to real life problems.
PECL307.3	Apply earthquake resisting design in civil engineering structures.
PECL307.4	Understand modern EQ resistant techniques.

Prerequisite:	Basic concepts of dynamics such as laws of motion, kinetics.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
PECL307.1	3	1	1	-	-	-	-	-	-	-	-	-	-	-	2
PECL307.2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
PECL307.3	3	3	3	-	-	-	-	3	-	-	-	-	2	-	3
PECL307.4	3	3	3	-	2	-	-	-	-	-	-	-	2	-	2

Content	Hours
Unit 1. Fundamentals of Seismology Basic terms, structure of earth, causes of an earthquake, plate tectonic theory, continental drift theory, elastic rebound theory, seismic waves, magnitude and intensity seismograph, strong motion earthquakes, Accelerogram.	8
Unit 2. Dynamics Fundamentals of theory of vibration, free and forced vibrations (harmonic loading) of single degree of freedom systems. Undamped and viscously damped vibrations, equations of motion and solution.	8
Unit 3. Response Spectrum and Seismic Forces Earthquake response spectrum, tripartite spectrum, construction of design response spectrum, evaluation of lateral loads due to earthquake on multi-storey buildings as per IS 1893– 2002 Part I.	8

Unit 4. Planning and Design Concepts Planning aspects, Load path, Stiffness and strength distribution, liquefaction and settlement, Behaviour of RC building, ductility and ductile detailing of beam and columns as per IS 13920.	7
Unit 5. Masonry Structures Behaviour of unreinforced masonry and reinforced masonry, RC bands, vertical reinforcement, openings, Provisions of IS 4326.	7
Unit 6. Modern Earthquake Resisting (EQR) techniques Concept of Base Isolation, Elastomeric, Sliding, Combined. Seismic Dampers - Friction Dampers, TMD, Visco elastic dampers.	7

Text Books:

1	S. K. Duggal, Earthquake Resistance Design of Structure –Oxford Uni. Press
2	A. K. Chopra, Dynamics of Structures- Theory and Applications to Earthquake Engineering – Prentice Hall Publications.

Reference Books:

1	D. J. Dowrick, Earthquake Resistant Structures –John Wiley Publication
2	Mario Paz, Structural Dynamics - CBS Publication

Codes:

1	IS 1893, Part-I, 2016 Criteria for Earthquake Resistant Design of Structures
2	IS 13920 - 2016 Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code of Practice

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Course Plan

Course Title: Advance Highway Engineering	
Course Code: 231CEPECL308	**Semester: VI**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

Highway Engineering is an engineering discipline branching from civil engineering that involves the planning, design, construction, operation, and maintenance of roads, bridges, and tunnels to ensure safe and effective transportation of people and goods with advanced methods & technologies.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	Evaluation and prediction of pavement performance, to learn Ranking and economic optimization of pavement maintenance and rehabilitation and management.
2	Study of Systems approach to Transportation Planning
3	Study of Transit and Non-Auto Modes & Road safety audit.
4	Introduction to applications of GIS in transportation engineering.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CL308.1	Design alternate pavement management systems based on life cycle cost analysis
CL308.2	Define different system approach to Transportation Planning
CL308.3	Understand the Transit and Non-Auto Modes & Road safety audit.
CL308.4	Explain the applications of GIS in transportation engineering

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Prerequisite:	Highway engineering-I, Engineering Survey

Course Articulation Matrix:

Mapping of Course Outcomes (CO's) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL308.1	3	3	-	-	-	3	-	-	-	-	-	3	3	-	3
CL308.2	3	-	-	-	-	3	-	-	-	-	-	3	-	-	2
CL308.3	3	3	-	-	-	3	-	-	-	-	-	3	3	-	3
CL308.4	3	-	-	-	-	3	-	-	-	-	-	3	-	-	2

Content	Hours
Unit-1 Pavement Management System: Components of PMS and their activities; Major steps in implementing PMS; Pavement Maintenance Management Components of Maintenance Management and Related Activities – Network and Project Level Analysis; Prioritization Techniques and Formulation of Maintenance Strategies	7
Unit-2 Transportation System Management (TSM) Philosophy: Systems approach to Transportation Planning; Long Term Strategies and Short term Measures; TSM actions – Objectives and Philosophy; Relevance of TSM actions to Indian Urban Context. Broad spectrum of TSM actions.	8
Unit-3 Transit and Non-Auto modes of Transportation: Preferential Treatment to High Occupancy Vehicles; Car Pooling; Transit Service Improvement Measures; Transit management Improvement Measures; Transit and Para Transit Integration; Para-transit Role in Urban Areas; Multi-modal coordination. Measures to Promote Non-Auto modes: Pedestrianization; Bicycle Transportation – Advantages; planning Bicycle facilities – Class I, Class II and Class III Bike-ways; Junction Treatments for Cycle Tracks; LOS criteria for Pedestrian and Bicycle facilities	8

Unit-4 Advanced Transit Technologies: Conventional and Unconventional Systems; Rapid Transportation Systems; New Technologies: LRT, Automated Highways, Hovercraft; System characteristics and suitability.	6
Unit-5 Application of GIS in Transportation Engineering: Intelligent information system for road accessibility study, GIS data base design for physical facility planning, Decision support systems for land use planning. Application of GIS in Transportation Engineering – II - GIS applications in environment impact assessment, GIS based Highway alignment, GIS based road network planning, GIS based traffic congestion analysis and accident investigation.	8
Unit-6 Crash Reconstruction: Describe the basic information that can be obtained from the roadway surface, understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies.	8

Text Books:

1	S. S. Kolapkar, P. G. Sonar, P. R. Minde, "Advance Transportation Engineering" Nirali Prakashan.
2.	Dr. Mandar S. Malandkar, Dr. Sachin M. Pore, "Applications of Remote Sensing and GIS" Nirali Prakashan

Reference Books:

1	Ezra Hauer, "Observational Before-After Studies in Road Safety", Pergamon Press, 2002
2	Ogden, K.W. "Safer Roads: A Guide to Road Safety Engineering" Avebury Technical,
3	Ralph Hass, Ronald Hudson and Zanieswki, "Modern Pavement management"- Krieger Publications.
4	W. Ronald Hudson, Ralph Haas and Waheed Uddin, "Infrastructure Management" Mc Graw Hill publication.
5	Haas and Hudson W. R. "Pavement management systems" McGraw Hill publications
6	S.R. Chari, "Transportation System Management Notes", REC, Warangal
7	John W Dickey, "Metropolitan Transportation Planning," Tata McGraw Hill
8	Mike Hudson, "The Bicycle Planning", Open Books, UK
9	Scholten & Stillwen "GIS for Urban & Regional Planning", 1990, Kulwer Academic Publisher.
10	Perspenfi Stan Aronoff, "GIS A Management", WDL Publisher

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Course Plan

Course Title: Advanced Surveying	
Course Code: 231CEPECL309	**Semester: VI**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

The course includes introduction to various advanced techniques of surveying which is an important field of civil engineering. The course aims to give thorough knowledge to students about the use of various modern methods/techniques in surveying.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	To get introduced to different geodetic methods of survey such as triangulation.
2	To get introduced to different methods and uses of Hydrographic Surveying
3	To study and analyze the technique of aerial photogrammetry and its uses.
4	To get introduced to modern advanced surveying techniques involved such as Remote sensing, GIS, GNSS, Photogrammetry etc.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to …**
CL306.1	understand different geodetic methods of surveying such as triangulation.
CL306.2	describe the methods of Hydrographic surveying.
CL306.3	analyse the technique of aerial photogrammetry
CL306.4	understand advanced surveying techniques such as Remote sensing, GIS, GPS

Prerequisite:	Engineering surveying

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL306.1	3	3	3	2	2	-	-	-	2	-	-	2	2	3	2
CL306.2	3	3	3	2	2	-	-	-	2	-	-	2	3	3	2
CL306.3	3	3	3	-	2	-	-	-	2	-	-	3	2	2	4
CL306.4	3	3	3	2	2		-	-	2	-	-	2	2	2	3

Content	Hours
Unit 1. Geodetic Surveying: Triangulation - Principle and Classification, systems, Selection of stations, Base line Measurement, Correction to base line measurements, use of sub-tense bar, Types of Signals, satellite station, Reduction to centre, Trilateration.	7
Unit 2. Hydrographic Surveying Introduction, shore line Surey, Soundings, Making the soundings, Methods of locating soundings, Reduction of soundings, The tides, prediction of tides, Tide gauges. Mean sea level as datum	8
Unit 3. Aerial Photogrammetry: Aerial photographs: types, scale, & resolution; Types of aerial cameras; Geometry of aerial photographs; Flight planning; Impact of season, time, & topography on aerial photographs; Parallax, relief displacement, Mosaics, Introduction to drone Surveying.	7

Unit 4. GIS a) Definition of GIS, History and development of GIS, Components of GIS, Hardwares and software, future of GIS. b) Representation of Geographic features in Raster and Vector data model: Advantages and Disadvantages, GIS Mapping.	8
Unit 5. Remote Sensing a) Definition, relevance, types, electromagnetic radiation and energy sources and its characteristics, applications to civil engineering.	7
Unit 6. Global Navigational Satellite System a) Introduction to GNSS; Types of GNSS; GNSS satellite; Differential GPS; Sources of GNSS errors; b) Application of GNSS in surveying, mapping and navigation.	8

Text Books:

1	B. C. Punmia, "Surveying", Vol 2 and Vol 3 -, Laxmi Publications
2	Basak, N.N., Surveying and Levelling, Tata McGraw Hill
3	Duggal, S.K., "Surveying" Vol I and II- Tata McGraw Hill

Reference Books:

1	Fundamentals of Surveying - S.K. Roy – Prentice Hall of India
2	Fundamentals of Surveying - Milton O. Schimidt – Wong, Cengage Learning
3	Surveying, Arther Bannister et al., Pearson Education, India
4	Anderson, James M., Mikhail, Edward M., Surveying: Theory and Practice- Tata McGraw Hill

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Course Plan

Course Title: Advanced Structural Analysis Lab	
Course Code: 231CEPECP304	**Semester: VI**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: NA**

Course Description:

Advanced Structural analysis is offered as core course at the first semester of Civil Structural Engineering post graduate program. This course focuses on basic concept and different analytical tools for understanding the behavior of especially of statically indeterminate structures. This course divided into four modules. The first module contains influence line diagram for cantilever, fixed, continuous beams, portal frames and arches. The Second module focuses on analysis beams curved in plan and Beam-Columns. The module three includes member oriented and structure-oriented stiffness and flexibility matrix methods. Module four contains Boundary value problems This course intends to build the competency in the students to identify indeterminate arches and portal structures, and to analyze the structures like fixed beam, continuous beam, frames. Also advanced topic such as beams curved in plan, beam-column analysis, matrix methods of analysis of structures and solution of boundary value problems

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	Develop ILD for reactions, S.F. and B.M. for indeterminate structures and construct SFD, BMD and TMD for beams curved in plan for various loading and support condition.
2	Analyse the beam-column structures
3	Analyse the structures by using the stiffness & flexibility matrix method.
4	Solve boundary value problems from civil engineering.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to…
CP304.1	Construct of ILD for reactions, S.F. and B.M. for determinate and indeterminate structures
CP304.2	Analyze SFD, BMD and TMD for beams curved in plan for various loading and support condition
CP304.3	Analyse the beam structures by using the stiffness & flexibility matrix method.
CP304.4	Solve boundary value problems from civil engineering.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs)and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP304.1	2	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CP304.2	2	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CP304.3	3	3	3	3	-	3	-	-	-	-	-	2	-	-	3
CP304.4	3	3	3	3	-	3	-	-	-	-	-	2	-	-	3

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Hours
1	Assignment bases on analytical problems on Influence line for statically determinate beams for bending moment and shear force due to concentrated and uniformly distributed loads	2
2	Assignment bases on ILD for propped cantilever, fixed beams, continuous beam	2
3	Assignment based on ILD for trusses	2
4	Assignment based analysis of determinate and indeterminate beams curved in plan such as cantilever circular arch	2
5	Assignment based analysis of determinate and indeterminate semicircular beams fixed at two ends subjected to point load and udl, simply supported semicircular beams, circular ring beam.	2

6	Assignment based on differential equation, geometric and material nonlinearity,	2
7	Assignment based on analysis of beam- columns simply and fixed supported at ends with concentrated load.	2
8	Assignment based on analysis of beam- columns simply and fixed Assignment at ends with moment and uniformly distributed load, magnification factor	2
9	Assignment based on analytical problems stiffness matrices for beam	2
10	Assignment based on analytical problems on stiffness matrices for truss, plane frame, pin and rigid jointed space frame element on member axis	2
11	Assignment based on overall joint stiffness matrix and nodal vector, assembly rules, calculation of member end forces	2
12	Assignment based on flexibility and stiffness matrices, analysis of continuous beams, trusses by structure-oriented approach	2
13	Assignment based on flexibility and stiffness matrices, analysis of continuous plane frames by structure-oriented approach	2
14	Assignment based on Approximate solution of boundary value problems	2
15	Assignment based on analytical problems on modified Galerkin Method for one-dimensional BVP, Matrix formulation of the Modified Galerkin Method	2

Text Books:

1	Vazirani and Ratwani, "Advanced Theory of Structures & Matrix Method", Khanna Publisher, Delhi.
2	Reddy C.S., "Basic structural Analysis", Tata McGraw Hill, Delhi.

Reference Books:

1	Timoshenko and Gere, "Strength of Materials", East West Press Ltd.
2	Gere and Weaver, "Matrix Analysis of Framed Structures", CBS Publishing, Delhi.
3	Pandit & Gupta, "Structural Analysis - A matrix approach", Tata McGraw Hill, Delhi.
4	Negi and Jangid, "Structural Analysis", Tata McGraw Hill Pub. Co. Delhi
5	N. Krishnaraju and D.R. Gururaja, "Advanced Mechanics of Solids & Structures", Narosa Pub. House Delhi.
6	Lewis P. E. and Ward J. P., "The Finite Element Method", Addison-Wesley Pub. Co.

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Course Plan

Course Title: Railway and Tunnel Engineering Lab	
Course Code: 231CEPECP305	**Semester: VI**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: NA**

Course Description:
It is the branch of Civil engineering deals with planning, design, construction, operation-maintenance of facilities providing for the railway and tunnel Engineering.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To introduce the fundamentals and advances in the area of railway Engineering.
2	To Understand Fundamentals and purpose of tunnels.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP305.1	Explain the main parts of railway tracks, such as rails, sleepers, ballast, and understand how railway systems are designed and organized.
CP305.2	Identify and explain how points, crossings, and signalling systems work in a railway network
CP305.3	Describe and compare new railway and tunnel projects to understand modern construction and technologies.

Prerequisite:	Transportation Engineering

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Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CL305.1	3	2	-	-	-	-	-	-	-	-	-	-	1	-	2
CL305.2	3	2	2	-	-	-	-	-	2	2	-	-	1	-	2
CL305.3	2	2	3	-	-	-	-	-	2	2	-	-	1	-	3

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Hours
1	Prepare report on Railway Zones in India	02
2	Introduction to Railway Engineering-permanent way and track components	02
3	Railway Track Design and Considerations	02
4	Role of Points and Crossings in Railway Networks	02
5	Railway Signaling and Safety Systems	02
6	Compile the relevant information on project Mumbai to Ahmadabad Bullet Train or Compile the relevant information on any project related to recent advancements in railway technology.	02
7	General Overview of Tunnel Engineering	02
8	Types of Tunnels	02
9	Alignment of a tunnel and the factors to consider during the process.	02
10	Geotechnical Considerations in Tunnel Engineering	02
11	Tunnel Construction Methods	02
12	Tunnel Safety, Ventilation, and Emergency Systems	02
13	Collect the details of new technologies of tunnel excavation and prepare the report	02
14	Compile the relevant information on project Atal tunnel or Compile the relevant information any project related to recent advancements in tunnel engineering.	02
15	Prepare a site visit report to the nearby railway station mentioning the details of the type of station, requirements fulfilling the station and any other important findings.	02

Text Books:

1	Arora, S. P. and Saxena, S. C, "A Textbook on Railway Engineering", Dhanpat Rai Publications (P) Ltd., New Delhi
2	R. Srinivasan, "Harbour, Dock and Tunnel Engineering" Charotar Publishing House Pvt. Ltd.

Reference Books:

1	M M Agarwal, "Railway Works Engineering", Prabha& Co. Delhi
2	Chandra Satish and Agrawal M.M., "Railway Engineering", ISBN: 978-0198083535, Oxford University Press, New Delhi.
3	Asheesh Kumar "Tunnel Engineering" Vayu Education of India
4	Subash C. Saxena "Tunnel Engineering" Dhanpat Rai Publications (P) Ltd.

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Course Plan

Course Title: Solid and Hazardous Waste Management Lab	
Course Code: 231CEPECP306	**Semester: VI**
Teaching Scheme: L-T-P : 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: N.A.**

Course Description:

In this lab course, students will be actively engaged with the principles and practices of solid and hazardous waste management. The challenges of waste generation and disposal through practical exercises that cover the entire lifecycle of solid waste, from collection to final treatment will be examined. A key emphasis will be placed on sustainable and environmentally responsible solutions.

Program Specific Outcomes (PSOs):

PSO1	To impart interdisciplinary knowledge and skills for enhancing employability
PSO2	To develop abilities in graduates to suit to the requirements of the varied industry

Course Objectives:

1	To provide knowledge of Solid waste management in practice
2	To provide knowledge of biomedical and Hazardous Wastes generation and management.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP306.1	Identify and understand the functional elements of solid waste, biomedical and hazardous waste management.
CP306.2	Execute problem-solving and communication skills to effectively manage hazardous materials and wastes, preparing you to practice as a health and safety professional.
CP306.3	Examine the underlying principles of both current and cutting-edge waste treatment methods, and evaluate strategies for recovering valuable materials.

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Prerequisite:	Environmental Studies, Environmental Engineering.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP306.1	3	3	3	-	-	2	3	-	-	2	-	-	1	1	2
CP306.2	3	3	3	-	1	2	3	-	2	2	-	1	1	1	3
CP306.3	3	3	3	-	2	3	3	-	-	2	-	1	1	1	4

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Hours
1	Solid waste management: Objectives, Functional elements	2
2	Solid waste: Sources, Types	2
3	Solid waste: Composition, Quantities, Properties.	2
4	Solid waste: Properties.	2
5	Solid Waste Generation, Collection	2
6	Solid Waste Storage, Transfer and Transport	2
7	Sorting and material recovery	2
8	Solid Waste Treatment: Composting	2
9	Solid Waste Treatment: Incineration	2
10	Solid Waste Treatment: Landfill	2
11	Biomedical Waste: Generation, identification, storage, collection	2
12	Biomedical Waste: transport, treatment	2
13	E-waste management, Radioactive waste management	2
14	Hazardous Wastes: Sources and Characteristics, regulations and legislations	2
15	Hazardous Wastes: Treatment and reclamation of landfill sites.	2

Text Books:

1	Bhide, A. D. and Sundaresan, B. B. (2001). Solid Waste Management – Collection, Processing and disposal. Mudrashilpa offset printers, Nagpur.
2	T. V. Ramachandra, Municipal Solid Waste Management, Published by Common Wealth of Learning, Canada; Centre for Ecological Sciences, IISc, Karnataka Environment Research Foundation
3	Tchobanoglous, G., Theisen and Vigil, Integrated Solid Waste Management: Engineering Principles and Management Issues, McGraw Hill, 1993
4	Peavy, H. S., Rowe, D. R. and Tchobanoglous, G. (1985) Environmental Engineering, McGraw-Hill Book Company, Singapore

Reference Books:

1	Municipal Solid Wastes (Management and Handling) Rules, 2000. Ministry of Environment and Forests Notification, New Delhi, the 25th September, 2000. Amendment – 1357(E) – 08-04-2016
2	Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Central Public Health and Environmental Engineering Organization (CPHEEO), 2016, Ministry of Urban Development, Government of India.
3	George Tchobanoglous, Frank Kreith, Handbook of Solid waste management, second edition, published by M/c Graw hill Education, 2002, ISBN-13 9780071356237 ISBN -10 0071356231

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Third Year B. Tech. Civil Engineering
SEM-VI (Academic Year 2025-26)

Course Plan

Course Title: Earthquake Engineering Lab	
Course Code: 231CEPECP307	**Semester: VI**
Teaching Scheme: L-T-P: 0-2-0	**Credits: 1**
INT Marks: 25	**ESE: NA**

Course Description:

The Earthquake Engineering Lab provides hands-on experience in vibration analysis, seismic simulation, and earthquake-resistant design. Students will engage in experiments to understand the dynamic behaviour of structures, evaluate material performance under seismic forces, and apply modern earthquake-resistant techniques.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To provide practical knowledge of vibration analysis and seismic response.
2	To understand the dynamic behaviour of structures through experimental methods.
3	To apply earthquake-resistant design principles in laboratory settings.
4	To explore modern earthquake-resistant techniques through hands-on experiments.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP307.1	Conduct vibration and seismic analysis experiments.
CP307.2	Evaluate the dynamic behaviour of structures under seismic forces.
CP307.3	Apply earthquake-resistant design techniques in practical scenarios.
CP307.4	Demonstrate the use of modern earthquake-resistant technologies.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP307.1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CP307.2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3
CP307.3	3	3	3	-	-	-	-	3	-	-	-	-	2	-	3
CP307.4	3	3	3	-	2	-	-	-	-	-	-	-	2	-	2

LIST OF EXPERIMENTS /ACTIVITY

Experiment No.	Experiment Name	Hours
1	Free Vibration Analysis of SDOF System	2
2	Forced Vibration Analysis of SDOF System	2
3	Damping Ratio Determination	2
4	Seismic Response of a Multi-Story Building Model	2
5	Liquefaction Analysis of Soil	2
6	Ductility Testing of Reinforced Concrete Beams	2
7	Base Isolation Techniques Demonstration	2

8	Seismic Dampers: Friction and Viscoelastic Dampers	2
9	Shake Table Testing of Structural Models	2
10	Dynamic Analysis of Masonry Structures	2
11	Evaluation of Seismic Forces on Structures	2
12	Retrofitting Techniques for Earthquake Resistance	2
13	Response Spectrum Analysis	2
14	Behaviour of Reinforced Masonry Structures	2
15	Modern Earthquake-Resistant Techniques: TMD and Base Isolation	2

Text Books:

1	S. K. Duggal, Earthquake Resistance Design of Structure –Oxford Uni. Press
2	A. K. Chopra, Dynamics of Structures- Theory and Applications to Earthquake Engineering – Prentice Hall Publications.

Reference Books:

1	D. J. Dowrick, Earthquake Resistant Structures –John Wiley Publication
2	Mario Paz, Structural Dynamics - CBS Publication

Codes:

1	IS 1893, Part-I, 2016 Criteria for Earthquake Resistant Design of Structures
2	IS 13920 - 2016 Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code of Practice

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Course Plan

Course Title: Advance Highway Engineering Lab	
Course Code: 231CEPECP308	**Semester: VI**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: -**

Course Description:

Advance Highway Engineering lab involves techniques & methods used for transportation system.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To study the Pavement Management System, TSM, Crash reconstruction
2	To study the various applications of GIS in Transportation engineering.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP308.1	Describe various modes of the pavement management systems & road safety audit.
CP308.2	Explain the use of GIS applications in transportation engineering.

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Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP308.1	3	3	-	-	-	3	-	-	-	-	-	3	2	-	3
CP308.2	3	-	-	-	-	2	-	-	-	-	-	3	2	-	3

LIST OF EXPERIMENTS /ACTIVITY

Ex. No.	Title	Hours
1	Pavement Management System- Introduction	2
2	Network and Project Level Analysis	2
3	Systems approach to Transportation Planning-TSM Philosophy	2
4	TSM actions to Indian Urban Context	2
5	Transit and non-auto modes of transportation: Introduction	2
6	Measures to Promote: Transit and Non-Auto modes of transportation	2
7	Advanced Transit Technologies: Conventional and Unconventional Systems	2
8	Advanced Transit Technologies: New Technologies: LRT, Automated Highways, Hovercraft	2
9	Application of GIS in Transportation Engineering: Intelligent information system for road accessibility study	2
10	Application of GIS in Transportation Engineering	2
11	Crash Reconstruction	2
12	Crash Reconstruction: Case Studies	2
13	Activity 1: Analysis of 4 km road project by Pavement Management System tools	2
14	Activity 2: Working model of GIS used in road construction	2
15	Activity 3: Presentation based on Advanced transit systems/TSM	2

Text Books:

1	S. S. Kolapkar, P. G. Sonar, P. R. Minde, "Advance Transportation Engineering" Nirali Prakashan.
2.	Dr. Mandar S. Malandkar, Dr. Sachin M. Pore, "Applications of Remote Sensing and GIS" Nirali Prakashan

Reference Books:

1	Ezra Hauer, "Observational Before-After Studies in Road Safety", Pergamon Press, 2002
2	Ogden, K.W. "Safer Roads: A Guide to Road Safety Engineering" Avebury Technical,
3	Ralph Hass, Ronald Hudson and Zanieswki, "Modern Pavement management"- Krieger Publications.
4	W. Ronald Hudson, Ralph Haas and Waheed Uddin, "Infrastructure Management" Mc Graw Hill publication.
5	Haas and Hudson W. R. "Pavement management systems" McGraw Hill publications
6	S.R.Chari, "Transportation System Management Notes", REC, Warangal
7	John W Dickey, "Metropolitan Transportation Planning," Tata McGraw Hill
8	Mike Hudson, "The Bicycle Planning", Open Books, UK
9	Scholten & Stillwen "GIS for Urban & Regional Planning", 1990, Kulwer Academic Publisher.
10	Perspenfi Stan Aronoff, "GIS A Management", WDL Publisher

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Course Plan

Course Title: Advanced Surveying Lab	
Course Code: 231CEPECP309	**Semester: VI**
Teaching Scheme: L-T-P: 0-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: NA**

Course Description:

The course includes introduction to various advanced techniques of surveying which is an important field of civil engineering. The course aims to give thorough knowledge to students about the use of various modern methods/techniques in surveying.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfill the needs of society.

Course Objectives:

1	To get introduced to different geodetic methods of survey such as triangulation.
2	To get introduced to different methods and uses of Hydrographic Surveying
3	To study and analyze the technique of aerial photogrammetry and its uses.
4	To get introduced to advanced surveying techniques using modern instruments like Total Station, DGPS etc.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP309.1	understand different geodetic methods of surveying such as triangulation.
CP309.2	analyse the technique of aerial photogrammetry
CP309.3	understand use of advanced surveying techniques using modern surveying instruments

Prerequisite:	Engineering surveying

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP309.1	3	3	3	-	2	2	-	-	2	-	-	2	2	3	2
CP309.2	3	3	3	2	2	-	-	-	2	-	-	2	2	3	2
CP309.3	3	3	3	-	3	2	-	-	2	-	-	2	3	2	4

List of Tutorials

Tutorial No.	Tutorial Details	Hours
1	Introduction to Geodetic Surveying	2
2	Problems based on triangulation techniques	2
3	Problems based on satellite stations and reduction to centre	2
4	Introduction to Hydrographic Surveying	2
5	Introduction to different equipment's for Hydrographic Surveying	2
6	Locating details in Hydrographic Surveying	2
7	Introduction to Aerial Photogrammetry	2
8	Problems based on relief displacement	2
9	Problems on flight planning for aerial survey	2
10	Plotting of small area Using Total Station	2
11	Introduction to GIS technique	2
12	Introduction to different GIS software	2
13	Introduction to Global Navigational Satellite System	2
14	Introduction to GPS techniques	2
15	Demonstration of DGPS	2

Text Books:

1	B. C. Punmia, "Surveying, Vol 2 and Vol 3 -, Laxmi Publications
2	Basak, N.N., Surveying and Levelling, Tata McGraw Hill
3	Duggal, S.K., Surveying. Vol I and II- Tata McGraw Hill

Reference Books:

1	Fundamentals of Surveying - S.K. Roy – Prentice Hall of India
2	Fundamentals of Surveying - Milton O. Schimidt – Wong, Cengage Learning
3	Surveying, Arther Bannister et al., Pearson Education, India
4	Anderson, James M., Mikhail, Edward M., Surveying: Theory and Practice- Tata McGraw Hill

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Course Plan

Course Title: Remote Sensing & GIS	
Course Code: 231CEMDML302	**Semester: VI**
Teaching Scheme: L-P-T: 2-0-0	**Credits: 2**
ISE + MSE Marks: 20	**ESE Marks: 30**

Course Description:

The course includes principles of GIS technology with an overview of GIS, Geographic Phenomena, Data Inputting and Editing in GIS, GIS Data Models, GIS System Architecture, Geographic Data Standards and Policies, Topology and Spatial Relationship, Spatial Data Analysis, Spatial Data Quality, Spatial Data Errors, Map Projection and Advanced Geospatial Modeling. The free and open-source software will be used as a platform for demonstrations and development.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To understand the basic principles of Remote Sensing and to study the modern techniques
2	To study different tools used to process and analyse the spatial and non-spatial data.
4	To understand the Earth Observation Sensors and Platforms, Thermal Remote Sensing, Spectral Signatures of Different Land cover Features and Visual Image interpretation and Hyperspectral Remote Sensing technology.
5	To apply the modern technology in the field of civil engineering.

Course Outcomes (COs):

COs	At the end of successful completion of course, the students will be able to
MDML302.1	Explain the Remote Sensing Principles.
MDML302.2	Demonstrate knowledge of Digital Image Processing.
MDML302.3	Explain use and application of GIS Technology
MDML302.4	Exhibit knowledge of Geospatial Data Analysis and Modeling.

Prerequisite:	Fundamentals of Civil Engineering.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
MDML302.1	2	-	-	-	1	1	-	-	-	-	-	2	-	-	3
MDML302.2	2	-	-	-	1	1	-	-	-	-	-	2	-	-	3
MDML302.3	2	-	-	-	1	1	-	-	-	-	-	2	-	-	3
MDML302.4	2	1	-	-	1	1	-	-	-	-	-	2	-	2	3

Content	Hours
Unit 1. Remote Sensing and Digital Image Analysis: Basic Principles of Remote Sensing **Digital Image Processing:** Basic Concepts of Rectification and Registration, Enhancement, Classification and accuracy assessment techniques.	7

Unit 2. Earth Observation Sensors and Platforms: Spectral Signature of different land cover features, Image interpretation, Thermal & Microwave Remote Sensing,	8
Unit 3. Geographical Information System: GIS, databases, topology, spatial analysis and open-source software.	7
Unit 4. RS and GIS Applications: Agriculture and Soil, Forestry and Ecology, Geoscience and Geo-hazards, Marine and Atmospheric Sciences, Urban and Regional Studies and Water Resources.	8

Text Books:

1	Joseph, G. (2005). Fundamentals of Remote Sensing. Universities Press (India) Pvt. Ltd, Hyderabad, India.
2	Lillesand, T. M., Ralph, K. W., Chipman, J. (2008). Remote Sensing and Image Interpretation, 6th edition. John Wiley.

Reference Books:

1	Sabins, F. F. (1996). Remote Sensing Principles and Interpretation. Waveland Pr. Inc..
2	Campbell, J. B. (2002). Introduction to Remote Sensing. Guilford Press.
3	American Society of Photogrammetry and Remote Sensing. Remote Sensing, 3rd Edition.
4	Jensen, J. R. (2000). Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall, New Jersey.
5	NPTEL Swayam by Prof. Poonam S. Tiwari, Indian Institute of Remote Sensing

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Course Plan

Course Title: Hydraulic Flow System	
Course Code: 231CEPCCP305	**Semester: VI**
Teaching Scheme: L-T-P: 1-0-2	**Credits: 1**
INT Marks: 25	**ESE Marks: 25**

Course Description:

The course explores the principles of fluid mechanics through laboratory experiments and verifies various hydraulic phenomena on laboratory setups.

Program Specific Outcomes (PSOs):

PSO1	To design and execute cost effective Civil Engineering solutions for sustainable development.
PSO2	To develop entrepreneur skills among the graduates to fulfil the needs of society.

Course Objectives:

1	To provide students hands-on practice for measurement of viscosity, pressure and discharge by using measuring devices.
2	To develop the skill required for applying knowledge to analysis of flow in pipe.
3	To develop the skill required for applying knowledge to estimate the losses in pipe flow.

Course Outcomes (COs):

COs	**At the end of successful completion of course, the students will be able to…**
CP305.1	Measure fluid flow parameters and apply to behaviour of real fluid properties
CP305.2	Develop the flow pattern and draw flow net
CL305.3	Calculate the different losses in pipes to be used in pipe design type of flow …

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Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

POs/ COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CP305.1	1	1	-	-	1	-	-	-	-	-	-	1	-	-	3
CP305.2	1	-	-	-	1	-	-	-	-	-	-	1	2	-	3
CP305.3	1	-	1	1		-	-	-	-	-	-	2	2	2	3

Content	Hours
Unit 1. Measurement of Pressure and Discharge **Measurement of pressure**: Piezometer, Barometer, Manometers, Mechanical gauges, Modern electronic devices **Measurement of flow:** Pitot tube, Venturi meter, Orifice meter, Orifice and mouthpiece, Rotameter, modern equipment's Metacentric height of floating objects.	7
Unit 2. Losses in Pipe Flow Pipes in series, pipes in parallel, Two reservoir problems, Pipe network, Friction Factor for pipes of different material and diameter, Minor Losses., Study of Moody's Chart, commercial pipe design nomograms, Reynold's Experiment,	8

LIST OF EXPERIMENTS /ACTIVITY

Sr. No.	Title	Hours
1	Study of Pressure Measuring Devices: Piezometer, Manometer.	2
2	Measurement of Discharge.	2
3	Determination of Metacentric Height for Floating Bodies	2
4	Verification of Bernoulli's Theorem	2
5	Calibration of Venturimeter	2
6	Calibration of Orifice Meter	2

7	Plotting of flow net	2
8	Determination of Hydraulic Coefficients of Orifice	2
9	Determination of Hydraulic Coefficients of Mouthpiece	2
10	Reynold's Experiment	2
11	Determination of Friction Factor for pipes of different material and diameter	2
12	Determination of Minor Losses in a Given Pipe	2
13	Study of Moody's Chart.	2
14	Study of commercial pipe design nomograms	2
15	Site Visit to Hydraulic Power Station	2

Text Books:

1	A.K. Jain -Fluid Mechanics — Khanna Pub., Delhi.
2	Modi/Seth – Hydraulic and Hydraulic Machines — Standard Book House, Delhi

Reference Books:

1	Streeter -Fluid Mechanics -McGraw-Hill International Book Co., Auckland.
2	V. T. Chaw - Flow in open channel –McGraw-Hill International Book Co., Auckland.
3	K. L. Kumar -Fluid Mechanics — Eurasia Publication House, Delhi.
4	Shames - Fluid Mechanics - McGraw-Hill International Book Co., Auckland.
5	Rangaraju -Open Channel flow– Tata McGraw-Hill Pub. Co., Delhi.
6	R.K. Bansal -Fluid Mechanics and hydraulic machine-, Laxmi Pubication

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