Government College of Engineering, Aurangabad

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Curriculum for
Third Year B. Tech. in Civil Engineering
With Multidisciplinary Minor Degree

(NEP Compliant)

(With Effect from Academic Year 2025-26)

Government College of Engineering, Chh. Sambhajinagar (Aurangabad)
(An Autonomous Institute of Government of Maharashtra)
Teaching and Evaluation Scheme with effect from 2025-26 (NEP)
B. Tech. Program in Civil Engineering with Multidisciplinary Minor
Third Year (T.Y.B.Tech.)

Dr. S. S. Koranne
Head, Civil Engg.

Dr. Anil Karwankar
Dean , Academics

Approved Curriculum in XXXth Academic Council Meeting
Dated: 5th July 2025

Semester -V											
			Teaching Scheme			Continuous Evaluation in terms of Marks					
	Course Code	Course Name	TH	T	PR	Credits	ISE I	ISE II	ISE III	ESE	Total
PCC	CEPCC3001	Transportation Engineering	3	0	0	3	15	15	10	60	100
PCC	CEPCC3003	Lab-Transportation Engineering	0	0	2	1			25	25	50
PCC	CEPCC3002	Geotechnical Engineering	3	0	0	3	15	15	10	60	100
PCC	CEPCC3004	Lab-Geotechnical Engineering	0	0	2	1			25	25	50
PCC	AMPCC3001	Design of Steel Structures	3	0	0	3	15	15	10	60	100
PCC	AMPCC3002	Lab-Design of Steel Structures	0	0	2	1			25	25	50
PEC		Program Elective- I	3	0	0	3	15	15	10	60	100
PEC		Lab-Program Elective-I	0	0	2	1			25	25	50
OE	CEOEC0030	Open Elective-III	2	0	0	2	10	10		30	50
MD(M)	CEMDM5004	Multidisciplinary Minor	3	0	0	3	15	15	10	60	100
MD(M)	CEMDM5005	Lab-MD(M)	0	0	2	1		0	25	25	50
Total			17	0	10	22	85	85	175	455	800
		Multidisciplinary Minor:									
	CEMDM5004	Application of AI in surveying									
	CEMDM5005	Lab- Application of AI in surveying									
		Open Elective-III									
	CEOEC0030	Watershed Management									
Semester –VI											
	Course Code	Course Name	TH	T	PR	Credits	ISE I	ISE II	ISE III	ESE	Total
PCC	AMPCC3003	Structural Analysis	3	0	0	3	15	15	10	60	100
PCC	AMPCC3004	Design of R.C.C. Structures	3	0	0	3	15	15	10	60	100
PCC	AMPCC3005	Lab-Design of R.C.C. Structures	0	0	2	1			25	25	50
PCC	CEPCC3005	Water Resources Engineering	3	0	0	3	15	15	10	60	100
PCC	CEPCC3007	Lab-Water Resources Engineering	0	0	2	1			25	25	50
PCC	CEPCC3006	Estimating, Costing and Valuation	3	0	0	3	15	15	10	60	100
PCC	CEPCC3008	Lab-Estimating, Costing and Valuation	0	0	2	1			25	25	50
PEC		Program Elective II	3	0	0	3	15	15	10	60	100
PEC		Lab-program Elective II	0	0	2	1			25	25	50
MD(M)	CEMDM5006	Multidisciplinary Minor	3	0	0	3	15	15	10	60	100
VSEC	CEVSE3001	Software for Civil Engineering	0	0	4	2			50		50
Total			18	0	12	24	90	90	210	460	850
		Multidisciplinary Minor:									
	CEMDM5006	Transportation Infrastructure and Smart Technologies									

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CEPCC 3001: Transportation Engineering		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Nil

Course description: This course introduces the fundamental elements of transportation infrastructure, including roads, railways, bridges, airports, docks, harbors, and tunnels. It covers the properties of materials, various material mixes, and the selection of suitable ingredients for mix design.

Course Outcomes:

After successful completion, students will be able to:

	Course Outcome
CO1	Understand highway alignment, geometric design, pavement construction, and road safety.
CO2	Understand material properties, mix design, pavement failures, maintenance, and strengthening methods.
CO3	Learn traffic studies, accident analysis, public transport integration, and traffic regulations.
CO4	Implement and understand the bridge construction.
CO5	Learn railway, airport, seaport, and tunnel infrastructure planning and management.

Detailed Syllabus:

Unit 1	**Geometric Design and Pavement** Importance & Modes of Transportation, Highway Alignment &Surveys, Drawing and reports, Highway Project, Highway geometric design, Cross sectional elements Sight Distance, Horizontal & Vertical Alignment, Interchanges, Grade separators, Different types of junctions, Highway Drainage, Road safety Issues Road Markings, Signs, Flyovers, Design of Flexible and Rigid pavements, construction joints in rigid pavement and related issues. Pavement Failure: flexible pavement failure, rigid pavement failure, maintenance of different types of pavements. Highway Capacity Analysis, Road Maintenance and Rehabilitation, Sustainable Transportation Planning.
Unit 2	**Material Properties, Mix and Pavement Design** Properties of materials, quality control issues and tests, Material mix design by Marshall method, strengthening of existing pavement: Objective of strengthening, types of overlays, different types of overlays, overlay design methodologies, effective thickness approach, design of overlays using effective thickness approach and deflection approach resorting to Benkelman Beam Method (IRC: 81-1981; IRC: 81-1997). Principles of economic evaluation and financing of a highway project.
Unit 3	**Traffic Engineering** Basic traffic theory, traffic studies, traffic volume count, traffic impacts, traffic analysis process, origin destination survey, speed and delay study, parking surveys, road network inventory, accident study - need, design of survey proforma, methods of conducting

	surveys, analysis and interpretation, instrumentation of traffic monitoring, Public Transport Integration and Enforcement of Traffic Regulations.
Unit 4	**Bridges** Bridges, Minor, major and long span bridges, Site Selection, Subsurface investigations for bridge constructions and its suitability. Collection of Bridge design data, Bridge hydrology. Catchment Area, Flood estimation methods in different regions, Waterway Time of concentration Scour depth & Depth of foundations Afflux, Freeboard, Economic span of bridges, High- & Low-level causeways, culverts, Box culverts, Types of Bridge foundations Various loads on bridge foundations, Bridge superstructure & Substructure, River training works and its Methods
Unit 5	**Rail, Airport, Docks and Harbours** Railway Track and its Components, Fixtures and Fasteners, Points and Crossings, Geometric Design, Stations and Yards, Track Maintenance and Modernization. Airport Authorities, Airport Planning, Design and Construction of Runways, Orientation of Runways, Taxiways and Apron Design, Airport Drainage and Pavement Management. Types of Docks and Harbours, Planning and Construction Aspects**,** Port Operations and Management, Coastal and Offshore Engineering, Ship Navigation and Berthing Facilities.

Text and Reference Books

1. S.P. Bindra, "Dock and Harbour"
2. Srinivasan, "Docks and harbour" Charotar publishing house pvt. ltd, Ananad Gujrat
3. C.E.G. Justo& S.K. Khanna, "Highway Engineering"
4. Partha Chakraborty and Animesh Das, "Principles of Transportation Engineering"
5. Ministry of Road Transportation &Highways Specification of road and bridges -2001 Govt. of India, New Delhi
6. S. K. Khanna, M.G. Arora & S.S. Jain, "Airport Planning and Design"
7. Yang H. Huang, "Pavement Analysis and Design"

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPCC 3003: Lab - Transportation Engineering		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	To conduct experiments on materials for road construction.
CO2	To design material mix for different types of pavement
CO3	Choose the appropriate tests on material and perform the practical.
CO4	Sketches of bridges, roads, railways, airport, docks and harbors

List of the Experiments

The student shall perform minimum eight experiments of the following:

Sr. No.	Title of the Experiments
1	**Different Tests on Aggregates** Gradation, Impact Value, crushing strength, Specific Gravity, Water absorption, Abrasion Value, Soundness, Flakiness and Elongation.
2	**Different Tests on Bitumen** Ductility, Penetration, Softening Point, Viscosity, Fire and Flash Point, Sp. Gravity, Stripping Value
3	Material mix design for flexible pavement
4	Material mix design for Rigid pavement
5	Marshal stability Method
6	Benkelman Beam Method for deformations of pavements
7	Laboratory and Field C.B.R. Methods
8	Design of flexible Pavement
9	Design of rigid Pavement
10	A report based on site visit to any Road/Bridges/Railway project during the academic term.

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPCC3002: Geotechnical Engineering		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits:03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Nil

Course description: **:** This course introduces the different terminologies in geotechnical engineering, soil classification methods, significance of permeability, seepage and shear strength parameters of soil, laboratory and field compaction methods, stability of slopes, general types of foundations.

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Understand and apply basic soil mechanics principles to identify various properties of soil.
CO2	Characterize and classify soils and calculate permeability of soil in various types of soil and field conditions.
CO3	Determine shear strength parameters and stresses in soils
CO4	Suggest suitable compaction methods, determine M.D.D., O.M.C values and Earth pressures
CO5	Choose Type of foundation as per site conditions. Select suitable exploration and boring

Detailed Syllabus:

Unit 1	Introduction, Soil problems in civil engineering, Major soil deposits of India, Soil phase system, Particle size and shape, Soil structures ,Weight volume relationships,
Unit 2	I.S. classification of soil, Permeability and seepage, Darcy's law, Laboratory and field methods for determination of coefficient of permeability, Determination of average permeability of stratified soil deposits, Critical hydraulic gradient, Quick sand condition.
Unit 3	Shear Strength Parameters of soil, Mohr's envelops for different types of soils, Pore pressure, Total and effective stress, Sensitivity and thixotrophy, Stresses in soils, Boussinesq's theory.
Unit 4	Soil compaction, Dry density and moisture content relationship, Zero air voids line, Standard proctor test and modified proctor test, Field compaction methods, Earth pressure, Stability of slopes, Classification and failure of slopes,.
Unit 5	Methods of exploration, Introductory concepts of foundation, Location and depth of foundation, Choice of foundation type and preliminary selection, Bearing capacity, Settlement of shallow foundations, Types of settlements, Causes and control of settlement.

References:

1. V.N.S.Murthy, "Soil Mechanics and Foundation Engineering", Vol. I, Saikrupa Technical Consultants, Bangalore.
2. Shashi K. Gulhati and Manoj Datta, "Geotechnical Engineering". Tata McGraw Hill Publication.
3. C. Venkatramaiah, "Geotechnical Engineering", New Age International Publication.
4. Dr. K. R. Arora. "Soil mechanics and foundation Engineering", Standard publishers distributors, Delhi.
5. Relevant Indian Standard Specifications and Codes.

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPCC3004: Lab- Geotechnical Engineering		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits: 01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Determine various index properties of soil.
CO2	Determine various engineering properties of soil.
CO3	Classify soil as per Indian Standards
CO4	To choose type of foundation to suit field conditions.
CO5	To calculate Safe bearing capacity values.

List of the Experiments

Sr. No.	Title of the Experiments
1	Water content determination by Oven drying method.
2	Determination of Specific gravity soil.
3	Sieve analysis and IS classification of soil.
4	Determination of consistency limits and soil classifications.
5	Field Density by core cutter, sand replacement and water displacement method.
6	Determination of coefficient of permeability by constant head and variable head method.
7	Direct shear test.
8	Unconfined compression test.
9	Vane shear test.
10	Standard proctor test.
11	Differential free swell test.

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

AMPCC3001: Design of Steel Structures		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 3	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Engineering Mechanics (EMESC1001), Solid Mechanics (AMPCC2001)

Course description:

To introduce the concept of structural design using steel sections, basic principles of design philosophies used in steel design and make the students aware of the code provisions for design. To make the students to understand the design procedures and detailing of various structural steel members

Course Outcomes:

After successful completion of the course, students will able to:

	Course Outcomes
CO1	Interpret the provisions of IS 800-2007 for the design of steel structural elements.
CO2	Design the structural members and joints using relevant codes and standards.
CO3	Complete detailing after the design of steel structural elements.
CO4	Design the steel structures.

Detailed Syllabus:

Unit 1	**(a)Introduction:** Types of structural steel used in general construction work, permissible stresses. Various Indian standard sections and their properties. Relevant IS specifications such as IS:800-2007, IS:808-1989, IS:875 part I to III, SP: 6(1), SP: 6(6),IS:4000-1992, Philosophy of limit state design for strength and serviceability, partial safety factor for load and resistance, various design load combinations, classification of cross section such as plastic, compact, semi-compact and slender. **(b)** Design of bolted, welded joint and its detailing.
Unit 2	**Tension Member** Various forms of tension members in steel structures, applications of tension member, suitability of different sections as a tension member, concept of net sectional area, shear lag concept in tension member. **Design of tension member:** Strength against yielding, rupture and shear strength. Design of tension members using various sections, Design and detailing of connections for the tension member by bolting and welding using gusset plate. Use of lug angle. Slenderness ratio
Unit 3	**Compression Member** Various types of sections used as compression member and different compression members in steel structures, Buckling classification as per the geometry of the section, effective length of compression members, design of compression member with its connection.

	Design of axially loaded column using rolled steel section. Design of built up column using lacing/battening, Slenderness ratio **Column Base for Axial Load:** Design of slab base and gusseted base
Unit 4	**Design of Flexural Member** Types of flexural members, Flexural strength of member. Design of laterally supported and unsupported beam using rolled steel section with and without provision of flange plate, check for deflection, Arrangement of main and secondary beams for floor, load transfer mechanism and its design
Unit 5	**Industrial Roofing** Various types of trusses used for industrial roofing, selection of types of truss, different components of roof truss. Relevant IS for ascertaining the loads on the roof truss. Different types of loads on roof truss. Calculation of various loads and load combinations for design of various components of roof truss. **Plate Girder and gantry Girder** Introduction to plate girder and gantry girder and its components. Preliminary design, concept of curtailment of flanges, Need and types of stiffeners in plate girder

Text and Reference Books

1. Design of Steel Structure by N. Subramanian, Oxford University Press, New Delhi
2. Limit State Design of Steel structure by S. K. Duggal, Tata Mc Graw Hill Education (India) Private Limited, New Delhi
3. Design of Steel Structure by Limit state method as per IS 800-2007 by S. S. Bhavikatti. I. K. International publishing House private limited, new Delhi
4. Limit State Design of Steel Structures by V. L. Shah and Gore. Structure publications, Pune
5. Fundamentals of Structural Steel Design. Based on Limit State Method as per IS 800-2007 by M. L. Gambhir. Tata Mc Graw Hill Education (India) Private Limited, New Delhi
6. Design of Steel Structures by Dr. P. Dayaratnam. S. Chand Publications, New Delhi
7. IS 800-2007, Indian Standard 'GENERAL CONSTRUCTION IN STEEL- CODE OF PRACTICE '
8. IS 875- 1987, Part I to IV 'CODE OF PRACTICE FOR DESIGN LOADS ON BUILDING AND STRUCTURES' (Dead load, imposed load, wind load and snow load)
9. IS 808-1989, Indian Standard 'DIMENSIONS FOR HOT ROLLED STEEL BEAM, COLUMN, CHANNEL AND ANGLE SECTIONS'

Assessment

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

AMPCC3002: Lab. Design of Steel Structures		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits: 01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After successful completion of this Lab. students will be able to:

	Course Outcomes
CO1	Design industrial steel truss
CO2	Prepare detailed drawing of industrial truss
CO3	Design and drawing of steel structural members using software

List of the Experiments/ Activities

Experiment / Activity	Details of Experiment/ Activities
1	Design and drawing of an Industrial shed consisting of steel truss, column and column base using Analytical or Graphical method.
2	Introduction to various software for analysis, design of structures and detailing

Assessment:

ISE III: The assessment is divided in two parts

c) It will be based on the term work and interaction with the students till 50% coverage of the activity

d) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

AMPEC3001: Advanced Concrete Technology		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Concrete Technology (AMPCC 2003)

Course description: The course consists of information about advanced materials used for making concrete, various mix design methods, durability and special concretes.

Course Outcomes:
After successful completion of the course, students will able to:

CO	Course Outcomes
CO1	Acquire knowledge of admixtures.
CO2	Design the concrete mix using various mix design methods
CO3	Correlate the exposure conditions in the IS to durability of concrete
CO4	Describe the development and application special types of concretes
CO5	Design and develop the high performance concrete.

Detailed Syllabus:

Unit 1	**Admixture** Chemical admixture – introduction, classification and compatibility of admixture, plasticizer (water reducer), super plasticizer, retarders, accelerators, air entraining admixtures, pozzolanic or mineral admixture uses, mechanism of action and their effect on properties of concrete.
Unit 2	**Concrete Mix Design** Introduction - Concept of mix design, nominal mixes, standard mixes and design mixes. Mix design proportioning methods. Factors affecting the choice of mix proportions, concrete mix design as per IS 10262 -2019, ACI method and DoE method
Unit 3	**Durability of Concrete Structures and Ready Mix Concrete (RMC).** Definition, factors affecting durability of concrete, effect of creep and shrinkage on durability of concrete, effect of variation in temperature on durability. Durability criteria as per IS 456-2000 Ready Mix Concrete- Layout of RMC plant. Specifications of materials and its manufacturing process
Unit 4	**Self- Compacting Concrete and Fiber Reinforced Concrete** Introduction to Self-Compacting Concrete, characteristics and properties of fresh Self Compacting Concrete, requirements of good quality Self Compacting Concrete, it's applications

	Fiber Reinforced Concrete: Type of fibers as per material, as per it's form and it's properties, effects of fibers on various properties of concrete, suitability of fiber reinforced concrete, advantages of fiber reinforced concrete
Unit 5	**High Performance and High Strength Concrete** Introduction: Definition of HPC, methods for manufacturing high performance concrete, characteristics and requirements for high performance concrete Suitability and applications of high performance concrete. Concrete mix design as per IS 10262-2019 and ACI code.

Text and Reference Books

1. A M Neville, Properties of Concrete, 4th edition, 2006, ELBS with Longman, UK
2. M L Gambhir, Concrete Technology, 3rd edition, 2006, Tata McGraw Hill, New Delhi
3. M S Shetty, Concrete Technology, 2008, S. Chand & Co., New Delhi
4. R .N. Raikar, Diagnosis and treatment of structures in distress, Published by R&D Centre
   of Structural Designers & Consultants Pvt. .Ltd., Mumbai, 1994.
5. A.R. Shanta Kumar, oxford university press.
6. Balaguru P.N. and Shah S.P., Fibre Reinforced Cement Composites, McGraw Hill, New Delhi
7. Hannant D.J., Fibre Cements and Fibre Concretes, John Willey and Sons, New York
8. IS-10262-2019, "Recommended guidelines for concrete mix proportion, Bureau of Indian Standard, New Delhi.
9. IS-456-2000, "Plain and Reinforced Concrete- Code of Practice", Bureau of Indian Standard, New Delhi.
10. ACI (American Concrete Institute)211.1-91, "Method of Concrete Mix Design"

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1) Technical quizzes
2) Application development
3) Question & answer / Numerical solution
4) Group discussion
5) Assignments on course content
6) Other if any
7) Attendance in the class

CEPEC3001 : Advanced Surveying		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: CEPCC2001 Surveying

Course description: The course introduces the advanced methods and instruments for measurement necessary for plotting maps and plans.

Course Outcomes:

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

CO	Course Outcomes
CO1	Apply advanced surveying techniques in different fields of Civil Engineering
CO2	Select the advanced surveying techniques which are best suited for a work
CO3	Compute and apply corrections to field measurements

Detailed Syllabus:

Unit 1	**Photogrammetry** Introduction, types, types of photograph, Terrestrial photogrammetry, photo theodolite, principle of terrestrial photogrammetry, Aerial photogrammetry: technical terms, scale, ground coordinates, relief displacement, flying height, computation of length and height from photograph, flight planning, ground control, radial line method of plotting, Stereoscopic vision, fusion, stereoscope, parallax in aerial stereoscopic views, difference in elevation by stereoscopic parallax, Photographic interpretation, applications of photogrammetry, Introduction to remote sensing
Unit 2	**Geodetic Surveying:** Triangulation, triangulation figures, classification of triangulation systems, selection of stations, intervisibility and heights of stations, towers and signals, phase of a signal, eccentricity of signals, Measurement of angle, instruments used, methods of observations, satellite station and reduction to center, Base line measurement, field work, correction to measurement, reduction to MSL, extension of base
Unit 3	**Triangulation Adjustment** Kinds of errors, Laws of weights, Determination of most probable values (MPV) of conditioned and independent quantities, Method of least squares, Indirect observations, Probable error and its determination, Distribution of error to the field measurements, Normal equation, Method of correlates. Station and figure adjustment of geodetic quadrilateral without central station.
Unit 4	**Introduction to Satellite Based Positioning System**

	SBPS systems - GPS, Glonoss, Galileo, Gagan, Compass, etc and their features, Segments of SBPS (Space, Control and User), their importance and role in SBPS, Positioning with SBPS - Absolute & Differential Methods, Use of SBPS in Surveying, SBPS Co-ordinates & heights, Factors governing accuracy in SBPS positioning, Different types of errors in SBPS Positioning.
Unit 5	**Hydrographic Surveying** Introduction, horizontal and vertical control, Shore line survey, Tide, tide gauges, Sounding, equipment, shore signal, angle measuring instruments, locating the sounding, reduction of sounding, plotting the sounding **Introduction to Remote Sensing** Basic principles, Electromagnetic spectrum, Interaction mechanism and image formation, Classification of remote sensing systems, platforms for sensing different types of data products, Applications to Civil Engineering,

Recommended Books:

1. Surveying: Vol. II. and III by Dr. B. C. Punmia : Laxmi Publication - New Delhi.
2. Surveying and Levelling Vol. II by T. P. Kanetkar and S. V. Kulkarni Pune Vidyarthi Publication.
3. GPS Sattelite Surveying—Alfred Leick—Wiley
4. Remote sensing and Geographical Information System, By A. M. Chandra and S. K. Ghosh, Narosa Publishing House.
5. Remote Sensing & GIS,2/E—Bhatta-- Oxford University Press
6. Principles of Geographical Information System—Burrough-- Oxford University Press
7. Surveying—M.D.Saikia—PHI Learning Pvt .Ltd.Delhi
8. Advanced Surveying -Total Station, GIS and Remote Sensing by SatheeshGopi, R.Sathikumar and N. Madhu , Pearson publication
9. Surveying Vol. 2 by S. K. Duggal, McGraw Hill Publication
10. Remote sensing & image interpretation, Lillesand& Kiefer, John wiley Pub. Dr. B.C.Punmia , Surveying Vol I & II, Laxmi Publications (P) Ltd. New Delhi, Sixteenth Edition Reprint 2008
11. R. Subramanian, Surveying and Levelling, Oxford University Press, New Delhi, First Edition, 2007

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPEC3002: Town Planning		
Teaching Scheme	**Examination Scheme**	
Lectures: 04 hrs/ week	**ISE I**	**15 Marks**
Credits: 4	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: NIL

Course description: The course covers the concept and importance of town planning in the development of cities. The various factors that affect the growth of the city and the regulations are covered. The various agencies involved and their role in the development of the cities is covered.

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Plan an ideal town
CO2	Select a site for the town and divide the plan in to various zones.
CO3	Analyze and design town with all amenities, decide sources for finance.
CO4	Suggest the remedial measures to reduce the slum and the rehabilitation techniques.

Detailed Syllabus:

Unit 1	Introduction, town planning in ancient India, Evolution of planning, principles of town planning, necessity of planning, growth of town, site selection for new town, Town planning surveys, its necessity, data collection, drawings and reports
Unit 2	Zoning in town planning, principles of zoning, Housing, requirements of residential, public, and industrial buildings, Government and non-government agencies involved in housing finance
Unit 3	Parks, classification, playground, public buildings, classification, principles of design of public buildings, town centers, grouping of public buildings, industries, manufacturing industries, classification of industries, requirement, industrial town
Unit 4	Building bylaws, importance of bylaws, local authorities, floor space index, slums, causes of slum, characteristics of slums, rehabilitation of slums
Unit 5	Development plan or Master plan, Objective of master plan, data collection, drawings, reports, replanning of existing towns

Text and Reference Books

1. Brown A J, Sherrard H M and Shaw J H (1969), "An Introduction to town and country planning", Angus and Robertson Ltd.
2. Gopal Bhargava Ed (1981) , ''Urban Problem and Policy Perspective'', Abhinav Publication, New Delhi
3. Rangawala S C,''Town Planning'', Charotar Publication, New Delhi
4. Guidelines of Urban and Regional Development Plans Formulations and Implementation,

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPEC3003: Advanced Fluid Mechanics and Hydraulic Machinery		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 3	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: CEPCC2002 Fluid Mechanics

Course description: The objective of this course is to introduce to students the concepts of fluid mechanics from both theoretical and applications perspective. There is a well-balanced coverage of physical concepts, mathematical operations along with example and exercise problems of practical importance. The course provides the platform for fundamental understanding of the basic principles of fluid mechanics and help to apply the basic principles to analyze fluid system.

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Apply concepts of kinematics dynamics of fluid flow and ideal flow
CO2	Apply the energy equations for practical problem related to fluid flow.
CO3	Analyze the effect of laminar flow, turbulent flow and boundary layer for fluid in motion
CO4	Apply equations for problems related to forces exerted by jet on plates
CO5	Gain the knowledge of performance and efficiency of turbines

Detailed Syllabus:

Unit 1	**Kinematics of Flow:** Equation of continuity in cartesian and cylindrical polar co-ordinate system, Lagrangian and Eulerian approach, elements of particle motion, circulation, rotation, vorticity, angular deformation, stream function, velocity potential function, Laplace's equation. Standard 2D Flow Patterns: source, sink, doublet and their combinations, super-imposed flow, D'Alembert's paradox.
Unit 2	**Dynamics of Flow:** Momentum equation, force exerted by a flowing fluid on a pipe bend, discharge through various orifice and mouthpieces **Laminar Flow:** Navier-Stokes equation of motion, exact and approximate solutions to Navier-Stokes equation, relationship between shear stress and pressure gradient, flow of viscous fluid in Circular Pipes-Hagen Poiseuille Law, flow of viscous fluid between two parallel plates: one plate is moving and other at rest-Couette flow, both plates at rest.
Unit 3	**Turbulent Flows:** Characteristics of turbulent flow, shear stress in turbulent flow: Boussinesq's theory, Reynolds theory, Prandtl's mixing length theory, universal velocity distribution, hydrodynamically smooth and rough boundaries: velocity distribution for turbulent flow in smooth and rough pipes, common equation for velocity distribution for both smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes.

Unit 4	**Boundary Layers:** Boundary layer, displacement, momentum and energy thickness, Karman's momentum integral equations, Local and average drag co-efficient, turbulent boundary layer on flat plate, boundary layer separation. **Impact of jets:** Dynamic of force and momentum, impulse momentum equation, jet force on stationary and moving vanes, jet propulsion.
Unit 5	**Hydraulic Machines** – Turbines, head and efficiency of turbine, classification of various turbines Pelton wheel turbine- arrangement, reaction turbine – Radial and Axial Flow turbine Franci's turbine.

Text and Reference Books

1. Fluid Mechanics and Hydraulic Machines – by R.K. Bansal, Laxmi Publications (P) Ltd., New Delhi.
2. A Textbook of Fluid Mechanics and Hydraulic Machines by Er. R.K.Rajput, S.Chand & Company Ltd.
3. Hydraulics and Fluid Mechanics – Modi and Seth, Standard Book House, Delhi
4. Fluid Mechanics and Hydraulic Machines – by V.L.Streeter and E.B.Wylie, McGraw Hill Publications, New York
5. White, F.M., "Fluid Mechanics", by White, F.M., McGraw-Hill.
6. "Advanced Mechanics of Fluids", by Rouse H, John Wiley.

Assessment: **ISEI:** Shall be based on Unit-I and Unit-II
ISEII: Shall be based on Unit-III and Unit-IV
ISE-III: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Application development
2. Power point presentation of case studies
3. Question & answer / Numerical solution
4. Quiz
5. Mini projects
6. Attendance in the class

CEPEC3004: Advance Water And Wastewater Treatment		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits:03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: CEPCC2006 Environmental Engineering

Course description: Urbanization is rapidly increasing, straining resources and infrastructure, and jeopardizing environmental quality. Therefore, it is necessary to ensure safe drinking water, effective waste disposal methods, and a pollution-free environment for maintaining good sustainable public health. A civil engineer is required to develop a basic understanding of the sources, characteristics, purification methods and conveyance system of water supply including the knowledge of domestic sewage disposal and its treatment. This course is intended to develop the basic competencies among the learners about water and wastewater treatments.

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Acquire the knowledge of basic characteristics of water and wastewater
CO2	Understand the kinetics of biological system.
CO3	Understand the design and working principle of various treatment methods.
CO4	Gain the knowledge of various wastewater treatment methods.
CO5	Understand magnitude and influence of pollutants.

Detailed Syllabus:

Unit 1	**Overview of Advanced Waste Water Treatment Introduction**: Need and Purpose of Advanced Water and Waste Water Treatment. Capabilities and limitations of conventional water and waste water treatment methods, Advanced water treatment Objectives of wastewater treatment system, Need for sanitation. Characteristics of waste water and flow variations. Types of reactors and reactors analysis. National and International Water Quality Standards
Unit 2	**Primary Treatment of water and wastewater-** Flow chart on Community water and waste water treatment system, Equalization basin. Bio-kinetic coefficients– Definition, Significance in Biological treatment and their determination. Membrane Bio Reactors (MBR) and SBR treatment process. Automation and real-time monitoring system in treatment plants.
Unit 3	**Aerobic and Anaerobic treatment methods-** Theoretical principles and design considerations; suspended growth system- Conventional activated sludge process and its modifications. Attached growth system– Bio-towers and Rotating Biological contactors. Water reuse and zero- liquid discharge (ZLD) concepts. Aerated lagoons. Upflow anaerobic sludge blanket (UASB). Anaerobic Lagoons.
Unit 4	**Advanced treatment technologies for water and waste water management-** Sludge Processing**,** Separation - sludge thickeners, volume reduction, conditioning and

	digestion – aerobic and anaerobic. Nitrification and De-nitrification Processes, Phosphorous removal. Wastewater disinfection.
Unit 5	**Role of microorganisms in wastewater treatment** - Degradation of Carbonaceous and Nitrogenous matter, high concentrated toxic pollutants, Water borne diseases and their global impacts, Antibiotic resistant bacteria in waste water. Heavy metals and persistent organic pollutants. Rural wastewater systems – Septic tanks, two-pit latrines, Eco-toilet, soak pits

Reference Books

Text and Reference Books

1. Wastewater Engineering - Treatment and Reuse", Metcalf and Eddy Inc., (2003), 4th Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. Environmental Engineering- Peary, Rowe & Tclobaloglous
3. Membrane Systems for Wastewater Treatment –Water Environment Federation
4. PeavyH. S.,Rowe D. R.,and Tchobanoglous G., Environmental Engineering, McGraw-Hill International Edition.
5 Arceivala S.J. and Asolekar S.R., Wastewater Treatment for Pollution Control and Reuse, Tata McGraw Hill.

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

AMPEC3002: Design of Precast and Composite Structure		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits:03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Mechanics of Materials (AMPCC2001), Design of Steel Structures (AMPCC3001)

Course description: Learn the concepts of precast concrete building design, including structural system selection and planning, plant and production methods, and transportation and erection sequences and applications and understanding of precast concrete construction.

Course Outcomes:

After successful completion of the course, students will able to:

	Course Outcomes
CO1	Acquire knowledge of design and development of problem solving skills.
CO2	Explore the concept of precast construction and design the precast structures
CO3	Understand the need, advantages and limitations of composite material
CO4	Apply basic mechanical principles in analysis of composite structures.
CO5	Understand and apply various provisions as per Indian standards in design of structural components using composite materials

Detailed Syllabus:

Unit 1	**Introduction to Precast Concrete Construction :** General principles of fabrication, need for prefabrication, comparison with monolithic construction, types of prefabrication, site and plant prefabrication, economy of prefabrication, modular coordination, standardization, materials, modular coordination, systems, production, transportation, erection
Unit 2	**Production and Fabrication :** Production technology, choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup, storage of precast elements, dimensional tolerances, acceleration of concrete hardening, hoisting technology, equipment for hoisting and erection, techniques for erection of different types of members like beams, slabs, wall panels and columns, vacuum lifting pads.
Unit 3	**Design of Precast Concrete Elements :** Prefabricated load carrying members: types of beams, design of simple rectangular beams and I beams, handling and erection stresses, elimination of erection stresses in beams, types of Slabs: construction of roof and floor slabs, design of hollow core slab, columns: construction and design principles of column, study of IS: 15916 and their applications.
Unit 4	**Introduction to Composite Construction:** Introduction to composite construction, basic concepts, types of composite constructions, Steel concrete composite, analysis and design of simply supported composite beams with solid steel beams.

Unit 5	**Design of Shear Connectors and composite columns** Types of shear connectors and its function, analysis and design of shear connection between concrete slab and beam Design of steel concrete composite columns, columns subjected to axial loads and moments.

Text and Reference Books

1. Design and Construction of Precast Concrete Structures, Ramachandra Murthy D. S., 1st Edition, Dipti Press OPC Private Limited, Chennai.
2. . Precast Concrete Structures, Hubert Bachmann and Alfred Steinle, Earns and Sohn
3. Steel-concrete Composite Structures, Narayanan R, Vol. 7, CRC Press.
4. Handbook of Composite Construction Engineering, Gajanan M. Sabnis and Van Nostrand Reinhold Inc ,U.S.
5. Composite Structures of Steel and Concrete: Beams, Slabs, Columns and Frames for Buildings, Roger P. Johnson, 4 th Kindle Edition.
6. Composite Structures I. H. Marshell Applied Science publishers.
7. IS: 11384-1985; Code of Practice for Composite Construction in Structural Steel and Concrete.

Assessment:

ISEI : Based on unit I and II

ISEII : Based on unit III and IV

ISEIII: Teacher's Assessment : Teacher's Assessment of 10 marks is based on one of the /

or combination of few of following

1) Simulation
2) Application development
3) Power point presentations of case studies
4) Question & answer /Numerical solution.
5) Study of Industry processes and its presentation
6) Mini project.
7) Attendance in the class

AMPEC3003: Lab-Advanced Concrete Technology		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/ Week	**ISE III**	**25 Marks**
Credit: 01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Use admixture to produce required concrete.
CO2	Design a concrete mix for given material
CO3	Assess quality of concrete.

List of the Experiments

It shall consist of,

Experiment No.	Details of Experiments
1.	Preparation of concrete mix design as per IS: 10262: 2019
2.	Experimental study on strength of concrete Compressive strength, flexure strength, split tensile strength of concrete using admixtures (mineral /chemical admixture)
3.	Determination of Strength of concrete using Non-Destructive test methods.
4.	Performing any two workability test on self-compacting concrete.
5.	Report writing on the visit to the RMC plant

Assessment:

ISE III : The assessment is divided in two parts

e) It will be based on the term work and interaction with the students till 50% coverage of the activity

f) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE will be based on oral/practical examination conducted by an External examiner appointed by the Institute and course coordinator

CEPEC 3005: Lab-Advanced Surveying		
Teaching Scheme	**Examination Scheme**	
Practical: 02 hrs/ week	**ISE III**	**25 Marks**
Credits: 1	**End Semester Examination**	**25 Marks**

Prerequisites: CEPCC2001 Surveying
Course description: The course deals with advanced methods of measurement and mapping.

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Use the advanced survey instruments.
CO2	Set out curves and buildings.
CO3	Prepare layouts and maps.

Detailed Syllabus:

1	Study of one second theodolite and measurement of horizontal and vertical angle
2	Study and use of stereoscope and parallax bar to find air base distance and difference of elevation for a given pair of photograph
3	Study and use of E.D.M. and total station
4	Setting out simple circular curve by linear and angular method
5	Setting out a building

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPEC3006: Lab Advanced Fluid Mechanics and Hydraulic Machinery		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Experience theoretical concepts through experimentation
CO2	Calibrate the measuring devices and will be able to use output of those devices for other analysis and design
CO3	Study and analyze performance of different types of turbines

List of the Experiments

Sr. No.	Title of the Experiments
1	Determination of coefficient of discharge for small orifice by constant head method
2	Demonstration of impact of jet
3	Performance characteristics of Pelton wheel turbine
4	Performance characteristics of Francis turbine
5	Performance characteristics of Kaplan turbine
6	Graphical representation for stream lines and equipotential lines for source, sink, doublet and superimposed flow
7	Design problems of turbines
8	Study and Calculate drag force for boundary layer

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPEC3007: Lab Advanced water and Wastewater Treatment		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Prerequisites: CEPCC2008 Lab. Environmental Engineering

Course description: Satisfying the stringent standards for disposal of treated effluents in various sinks and reusing/ recycling of treated effluents for different uses requires that the wastewater be given more exhaustive and advanced treatment. Hence this laboratory subject aims to give knowledge to the students regarding advanced wastewater treatment technologies.

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Interpret the water demand and quality of water
CO2	Select the distribution system and pipe network for water supply.
CO3	Interpret the plumbing system and sewer appurtenances.
CO4	Apply the wastewater treatment processes

List of the Experiments

The student shall perform minimum eight experiments of the following:

1	Detailed design report of water and waste water treatment plant for given population of town
2	Measurement of Electrical conductivity and turbidity
3	Determination of fluoride in water by spectrophotometric method
4	Determination of iron in water.
5	Determination of Sulphate in water.
6	Determination of available Chlorine in Bleaching powder and residual chlorine in water.
7	Determination of the optimum dose of coagulant in the given raw water sample by jar test.
8	Estimation of suspended, volatile and fixed solids
9	Determination of Sludge Volume Index in waste water.
10	Determination of TKN and Ammonia Nitrogen in wastewater.
11	Determination of heavy metals in water by AAS method.
12	Preparation of report on field visit to the nearby water treatment plant.

Text and Reference Books

1. Waste water Engineering: Treatment and Disposal by Metcalf & Eddy
2. Environmental Engineering- Peary, Rowe & Tclobaloglous
3. Membrane Systems for Wastewater Treatment –Water Environment Federation
4. PeavyH. S.,Rowe D. R.,and Tchobanoglous G., Environmental Engineering, McGraw-Hill International Edition.
5 Arceivala S.J. and Asolekar S.R., Wastewater Treatment for Pollution Control and Reuse, Tata McGraw Hill.

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

AMPEC3004: Lab of Design of Pre-Cast and Composite Structures		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs / Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After successful completion of the Lab students will be able to:

	Course Outcomes
CO1	Identify design principles and IS code specifications.
CO2	Design precast structures and Explore the concept of precast construction
CO3	Design Shear Connectors and composite columns.

List of the Experiments

Sr. No.	**Title of the Experiments**
1	Assignment on Unit 1 covering all the topics listed in syllabus
2	Assignment on Unit 2 covering all the topics listed in syllabus
3	Design and detailing of any one design problem from Unit 3 or Unit 4 on A4 sheet
4	Design and detailing of any one design problem from Unit 5 on A4 sheet
5	Report on site visit (Precast or Composite Structures) covering the contents of the syllabus mentioned above.

Assessment:

ISE III The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment will be based on oral / practical examination conducted by an External examiner appointed by the Institute and course coordinator

CEOEC0030: Watershed Management		
Teaching Scheme	**Examination Scheme**	
Lectures: 02hrs./ week	**ISE I**	**10 Marks**
Credits: 02	**ISE II**	**10 Marks**
	ISE III	**-**
	End Semester Examination	**30 Marks**

Prerequisites: NIL

Course description: This course introduces the watershed and different techniques which are used for its sustainable development. The course provides experience in solving the difficulties in watershed management, use of modern techniques, role of various sectors, etc. You will also learn necessity of watershed management.

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Describe the concepts of watershed development
CO2	Explain the reasons for the erosion from the watershed and the methods to control it
CO3	Explain the methods of water harvesting
CO4	Discuss about land use management
CO5	Describe the role of ecosystem in bringing the best water use practices and apply the knowledge to plan watershed development activities

Detailed Syllabus:

Unit 1	**Introduction and the characteristics of the watershed:** Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multi-disciplinary approach for watershed management. Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socioeconomic characteristics, basic data on watersheds.
Unit 2	**Erosion and its control:** Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation; Measures to control erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.
Unit 3	**Water harvesting**: Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks. **Land management:** Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils. Role of GIS in watershed modeling its necessity and planning, data development and its application.
Unit 4	**Ecosystem Management and watershed management:** Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation. Planning of activities, people's participation, preparation of action plan, administrative requirements.

Text and Reference Books

1. Watershed Management: Design and Practice. P. K. Singh, 2000. E-media Publications, Udaipur.
2. Hydrology. H. N. Raghunath. New Age International Publishers, 2004 reprint.
3. Hydrology and Soil Conservation Engineering: Including Watershed Management. Ghanshyam Das, 2008. Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
4. J. V. S. Murty, "Watershed Management", 2ndEdition, New Age International Publishers, 2013.
5. V.V.N. Murthy and Madan K Jha. "Land and Water Management", 6thEdition, Kalyani Publishers, 2015.

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

CEMDM5004 (MDM): Application of AI in Surveying			
Teaching Scheme		**Evaluation Scheme**	
Theory	**3 Hrs/Week**	**ISE I**	**15 Marks**
Total Credits	**3**	**ISE II**	**15 Marks**
		ISE-III	**10 Marks**
		End Semester Examination	**60 Marks**

Prerequisites:

Nil

Course Description:

Every civil project involves collection, presentation and interpretation of data for execution works. Diploma civil engineer should acquire competencies to undertake linear measurements, angular measurements and understand the concept of digital mapping. This basic technology level course aims at imparting skills in identifying and making the of basic survey instruments to undertake survey works required for different civil engineering projects. The syllabus also explores recent advancements through the integration of Artificial Intelligence (AI) and Machine Learning (ML) in survey data collection, interpretation, and processing. The objective is to expose students to intelligent mapping, automation, and decision-support systems that enhance accuracy, speed, and efficiency in surveying applications.

Course Outcomes:

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

CO	Course Outcomes
CO 1	Relate various maps, scale, symbols and principles of surveying.
CO 2	Select suitable instrument for linear measurement and method of ranging
CO 3	Make suitable use of theodolite and Plane Table survey
CO 4	Illustrate the concept of GPS and application of GPS.
CO 5	Use of AI & ML in surveying

Detailed Syllabus:

Unit 1	**Unit 1 Introduction to Surveying** Definition, classification, objectives, principles of surveying, Measurement of distance – chaining and taping, errors in chaining, Types of chains and tapes, corrections for measured length, Introduction to digital surveying and smart tools, Basic principles of automated data collection
Unit 2	**Compass and Theodolite Surveying** Types of compass, bearing system and conversions, Local attraction, traversing, Theodolite parts, temporary adjustments, measurement of horizontal and vertical angles, Gyroscopic compass and electronic theodolite integration with drone control, Real-time angle correction using AI algorithms
Unit 3	**Leveling and Contouring** Concepts of leveling, types of levels and leveling staff, Methods of leveling, reduction of levels, errors and corrections, Contouring: characteristics, methods, and applications, AI-based terrain interpretation from DEM(Digital Elevation Map)/DSM(Digital Surface Model) data, ML models for automatic contour generation from drone imagery

Unit 4	**Plane Table and Tacheometric Surveying** Instruments, methods, and advantages of plane tabling, Tacheometry: principles, stadia method, tangential method, Drone-assisted plane tabling and positioning, Data fusion from tacheometer and drone imagery using ML models
Unit 5	**Photogrammetry** Introduction, types, types of photograph, Terrestrial photogrammetry. Photo theodolite, principle of terrestrial photogrammetry, Aerial photogrammetry: technical terms, scale, ground coordinates, relief displacement, flying height, computation of length and height from photograph, flight planning, Stereoscopic vision, fusion, stereoscope, parallax in aerial stereoscopic views, difference in elevation by stereoscopic parallax, Photographic interpretation, applications of photogrammetry.

Reference books

1. **B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain**, *Surveying – Vol. I, II & III*, Laxmi Publications
2. **Dr. K.R. Arora**, *Surveying Vol I & II*, Standard Book House.
3. **S.K. Duggal**, *Surveying (Vol I & II)*, McGraw Hill Education
4. **Madhu Sudan Dhar**, *Surveying and Levelling*, Oxford University Press
5. **Yunlong Zhang**, Drone Data Analytics in Civil Engineering – Springer
6. **Zhe Zhu & Curtis Woodcock**, Machine Learning in Remote Sensing – Wiley
7. **Kumar & R. Joshi**, AI and ML for Civil Engineers – CivilTech Press
8. **Paul R. Wolf & Bon A. Dewitt,** Elements of Photogrammetry with Applications in GIS, McGraw Hill
9. **T. M. Lillesand, R. W. Kiefer, Jonathan Chipman,** Remote Sensing and Image Interpretation, Wiley
10. **Jayakrishnan Gopalakrishnan & Mohamad Kassem (Editors),** Artificial Intelligence in the Built Environment, CRC Press
11. **Srinivasa Rao Kandukuri, Pradeep M. Mohite,** Drone Technology in Civil Engineering, Wiley India / Local Publications
12. **Abhishek Gupta,** Machine Learning for Spatial Data Analysis, A press
13. **Chakraborty, S. & Gupta, D.,** AI and ML Applications in Civil Engineering, Springer Publication (Recent Editions)

ISE-I: Class test based on Unit I and Unit II
ISE-II: Class test based on Unit III and Unit IV
ISE-III: Teacher's Assessment- Teachers Assessment of 10 marks may be based on one or more of the following

1) Technical quizzes
2) Application development
3) Question & answer / Numerical solution
4) Group discussion
5) Assignments on course content
6) Attendance in the class

7) Other if any

CEMDM5005: Lab - Application of AI in Surveying		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Examination**	**25 Marks**

Course Outcome: On successful completion of this course, students will be able to

CO	Course Outcome
CO1	Select the instruments for linear and angular measurements
CO2	Demonstrate equipment for linear and angular measurements
CO3	Make use of the instruments for linear and angular measurements

List of Experiments

Sr. No.	Details
1	Use of dumpy level to determine elevations of points.
2	Differential Levelling to determine elevations of points.
3	Study and use of plane table survey.
4	Radiation and intersection method in plane table survey.
5	Study and use of Theodolite for measurement of angles.
6	Measurement of horizontal and vertical angle using transit theodolite.
7	Automatic Contour Generation from Drone Imagery using AI and Machine Learning Techniques
8	Integration of Electronic Theodolite with Drone Navigation and Real-Time AI Angle Correction

Assessment:

ISE III The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity

b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment will be based on oral / practical examination conducted by an External examiner appointed by the Institute and course coordinator

AMPCC3003: Structural Analysis		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Engineering Mechanics (AMESC1001), Solid Mechanics (AMPCC2001)

Course description: The course provides fundamental understanding of the behavior of the structures under various supporting and loading conditions. Different methods of analysis of various types of structures have been discussed. It will help students in designing the structures.

Course Outcomes:
After successful completion of the course, students will able to:

	Course Outcomes
CO1	Apply the different methods for analysis of truss.
CO2	Demonstrates the ability to choose suitable method for analysis.
CO3	Apply force method for the analysis of statically indeterminate beams, plane frame.
CO4	Apply displacement method for the analysis kinematic indeterminate beams, plane frame.
CO5	Recognize the importance of influence line diagrams and its applications.

Detailed Syllabus:

Unit 1	**Fundamental of Structural Analysis** Degree of static and kinematic indeterminacy of a structures. Castigliano's strain energy theorems, reciprocal deflection theorems and their applications. Analysis of statically determinate and indeterminate pin jointed trusses using method of joint, section and unit load method.
Unit 2	**Analysis of Indeterminate Beam** Analysis of propped cantilever, fixed and continuous beams, Consistent deformation method, yielding of supports, deflection at a section using unit load method. Shear force, bending moment at a section and shear force and bending moment diagrams.
Unit 3	**Analysis of Indeterminate Structures : Force Method** Force methods of analysis, Clapeyron's theorem of three moment, yielding of supports, Analysis of continuous beams and plane frame with degree of static indeterminacy up to three. Analysis of three and two hinged arches.
Unit 4	**Analysis of Indeterminate Structures : Displacement Method**

	Displacement methods of analysis, Slope deflection method: Slope deflection equations, Moment distribution method: Stiffness, distribution factor, carry over moments. Application of methods to analysis of beams and frames with degree of kinematic indeterminacy up to three.
Unit 5	**Influence Line Diagrams and Rolling Loads** Concept of influence line, Muller Breslau's principle, influence line diagram for support reactions, shear force and bending moment at a section of statically determinate beams and forces in the members of statically determinate trusses. Wheel loads, criteria for maximum shear force and bending moment.

Text and Reference Books

1. S.J. Kinney, Indeterminate Structural Analysis, Oxford and IBH.
2. Timoshenko S.P and Young D.H. , Theory of Structure, Tata McGraw Hill, New Delhi.
3. Russell C. Hibbeler, Structural Analysis, Pearson Education, India.
4. S. Ramamrutham and N Narayan, Theory of Structure, Dhanpat Rai, New Delhi.
5. Weaver, William, Gere, James M., Matrix Analysis Framed Structures, CBS, New Delhi.
6. C.S. Reddy , Basic Structural Analysis, Tata McGraw Hill, New Delhi.
7. C. K. Wang, Indeterminate Structural Analysis, Tata McGraw Hill, New Delhi.
8. K. M. Leet, Vang, Gilbert, Fundamentals of Structural Analysis, McGraw Hills
9. Senol Utku, Charles Head Norris, John Benson Wilbur, Elementary Structural Analysis, TMH.

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following;

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

AMPCC3004: Design of Reinforced Concrete Structure		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 3	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Solid Mechanics (AMPCC2001), Concrete Technology (AMPCC2003),

Course description:

To introduce the concept of structural design using RCC sections, basic principles of design philosophies used in RCC design and make the students aware of the codal provisions for design. To make the students to understand the design procedures and detailing of various RCC structural members

Course Outcomes:

After successful completion of the course, students will able to:

	Course Outcomes
CO1	Interpret the provisions of IS 456-2000 for the design of RCC structural elements.
CO2	Analyse and design of RCC structural members using relevant codes and standards.
CO3	Complete detailing after the design of RCC structural elements.
CO4	Associate with the design concept with overall design of RCC structures.

Detailed Syllabus:

Unit 1	**A) Design Philosophies**: Introduction to various design philosophies R.C structures: Historical development, working stress method, ultimate load method and limit state method. **Limit state method:** Limit state of collapse, limit state of serviceability. Importance of deflection and it's permissible limits as per IS code. Characteristic strength, characteristic load, concept of safety - Partial safety factors for material strengths and loads. Study of structural properties of concrete. **B) Limit State of Collapse (Flexure)-I:** Assumptions of Limit state method, stress and strain variation diagrams, design parameters for singly reinforced rectangular section, moment of resistance of balanced, under reinforced section
Unit 2	**A) Limit State of Collapse (Flexure)-II:** Moment of resistance of doubly reinforced and flanged section. Design of flexural members - simply supported, continuous and cantilever beams **B) Limit State of Collapse (Shear and Bond):** Development of shear cracks, Factors affecting shear failure, strength of beam in shear, design of shear reinforcement as per IS recommendation **Bond:** Factors affecting bond strength of concrete, concept and importance of development length, check for development length
Unit 3	**Design of Slabs** **Design of one way slab:** For simply supported, continuous and cantilever conditions **Design of two way slab:** For simply supported, continuous , cantilever conditions and restrained conditions

Unit 4	**Design of Column:** Introduction, stress strain variation diagrams for column, types of columns, load carrying capacity of axially loaded short column with minimum eccentricity requirements. Effective length of column Design of axially loaded short column, Pu-Mu interaction diagram, design of column subjected to uniaxial and bi-axial bending using interaction curves
Unit 5	**A) Design of footing:** Design of isolated square and rectangular footing subjected to axial load, uniaxial and biaxial bending, design of trapezoidal footing **B) Staircases:** Types of staircases, planning of staircase. Design of dog-legged staircase

Text and Reference Books

1. B C Punmia, A K Jain, Comprehensive Design of RCC Structures, Laxmi Publications Private Ltd., New Delhi
2. S U Pillai and Devdas Menon, Reinforced Concrete Design, Tata-McGraw-Hill Publishing Company Limited, New Delhi.
3. S Ramamrutham, Design of Reinforced Concrete Structures, Dhanpat Rai Publishing Company, New Delhi
4. V L Shah and S R Karve, Limit State Theory and design of reinforced Concrete, Structures Publications, Pune, 2011
5. A.K. Jain "Reinforced Concrete Limit state Design". Nem Chand & Brothers 2007
6. Park R and Paulay T, Reinforced Concrete Structures, John Wiley & Sons, Inc., New York, 1975
7. Sinha S.N. "Reinforced Concrete Design". Tata –Mc-Graw-Hill New Delhi.
8. IS 456: 2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi

Assessment

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following:

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

AMPCC3005: Lab. Design of Reinforced Concrete Structures		
Teaching Scheme	**Examination Scheme**	
Practical: 2 Hrs/ Week	**ISE III**	**25 Marks**
Credits: 01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Analyze and design residential/public/commercial building
CO2	Prepare detailed drawing of residential/public/commercial building
CO3	Design and drawing of RCC structural members using software

List of the Activities

Activity	Details of Activities
1	Design and detailing of residential / commercial / public building. The selected building should be Minimum G+2 structure and minimum area of 80 m2. The drawings are to be prepared either manually or by using Auto-CAD software
2	Introduction to various software for analysis, design of structures and it's detailing

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPCC 3005: Water Resources Engineering		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits:3	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: NIL

Course Description: This course focus on the planning, development and management of water resources. It covers topics such as hydrology, hydraulics, irrigation method, Watershed management, Flood control and sustainable water resource. Student will learn techniques for designing and analyzing water related structures and system to meet agriculture, industrial and domestic demands while addressing environmental and societal challenges.

Couse Outcomes: After successful completion of the course student will be able to,

	Course Outcomes
CO1	Describe different terminologies related to hydrology
CO2	Analyze the hydrological and other parameters required for design and Management of water resources.
CO3	Compute the availability of the water resources and decide the mode of Application of water, frequency of irrigation and other precautions so as to avoid water logging and soil infertility.
CO4	Select appropriate structures and justify the selection, Various hydraulic structures and check the stability
CO5	Modern Tools and Technique in the planning and management of Water Resources.

Detailed Syllabus:

Unit 1	**Hydrology:** Introduction **Precipitation:** Forms and Measurement of Precipitation, Rain gauge network, Presentation of rainfall data, Estimation of mean precipitation, Depth area duration curve, Frequency of rainfall, Probable maximum precipitation. **Evaporation- Evapo-Tranpiration**: Evaporation process, Measurement of Evaporation and Evapotranspiration, Reduction in Evaporation **Infiltration:** Its process, Capacity, Measurement and Indices
Unit 2	**Runoff and Hydrograph:** **Runoff:** Routes of Runoff, Rainfall Runoff Coefficient, Strange Table, Factor affecting runoff, Flow Distribution curve, Mass curve **Hydrograph:** Introduction, Factors affecting Hydrograph, Components of Hydrograph, Base Flow, Effective Rainfall **Unit Hydrograph:** Use and Limitations, Derivation of Unit Hydrograph, Synthetic Unit Hydrograph, Instantaneous Unit Hydrograph **Flood:** Design Flood and Methods of its estimation, Empirical Formula, Frequency Analysis

Unit 3	**Ground Water Hydrology and Crop water requirement** **Ground Water:** Aquifer and their types, Parameters, Specific Yield of Wells, Theim's and Dupuit's theory for well's in Confined and Unconfined Aquifer, Ground water recharge and suitable methods **Crop Water Requirement:** Factors affecting Crop Water requirement, Irrigation Standards, Crop period, Base Period, Wilting Point, Optimum utilization of Irrigation water, Irrigation efficiencies, Delta, Duty, Determination of duty, Crops and Season in India. Cropping Pattern, Water Application Method.
Unit 4	**Dams:** Site selection, classification, storage capacity **Gravity Dam:** Forces acting on Dam , Stability analysis of Gravity dam **Earthen Dam:** Types, Elements of Earth Dam, their function & construction aspects, Causes of failures **Arch and Buttress Dam:** Introduction, Types and stability of dam **Hydraulic Structures:** **Spillway:** Types & Spillway Capacity, Energy and Dissipation Spillway Gates **Canals:** Tyes of canal, Canals alignment, Kennedy's and Lacey's Silt Theories **Cross Drainage Work:** Types , necessity, Head regulator, Cross regulator, Canal Falls, Weirs and Barrage's, Khosla's Theory and Dam Outlets
Unit 5	**Remote Sensing and GIS applications in Water Management** Decision support systems and hydrological models, Climate change and its impact on water resources, Case studies on successful water resource projects

Text and Reference Books:

1. Subramanya K, "Engineering Hydrology" , Tata Mc Graw Hill Publications, New Delhi.
2. Sing Vijay P., " Elementary Hydrology", Prentice Hall of India Publication, New Delhi
3. Garg Santosh K., " Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi
4. Punmia B.C. Pande and Lal B.B., "Irrigation and Water Power Engineering", Laxmi Publications Pvt. Ltd. New Delhi
5. Modi P.N., " Irrigation, Water Resources and Water Power Engineering",Standard Book House New Delhi
6. Wurbs R. A. and James W.P., " Water Resources Engineering", Prentice Hall of India, Pvt. Ltd. New Delhi
7. Asawa G.L., " Irrigation and Water Resources Engineering", New age International (P) Ltd.
8. Varshney R.S. , " Concrete Dams", Oxford and IBM Publishing Company
9. P.K Joshi, P.K Garg ''Remote Sensing and GIS for Environmental studies''.
10. Ram S. Gupta ''Hydrology and Hydraulic Systems''
11. Tamim Younos Catlin A Grady ''Climate Change and Water Resources''

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPCC 3007: Lab-Water Resources Engineering		
Teaching Scheme	**Examination Scheme**	
Lectures: 02 hrs/ week	**ISE III**	**25 Marks**
Credits:1	**End SemesterExamination**	**25 Marks**

Prerequisites: Nil

Course description: Water is an important natural renewable water resource. This laboratory course deals with different hydrological aspects of water, its availability, and aerial distribution. It also deals with the stability and design aspects of hydraulic structures. In order to get acquainted with field conditions and status of water availability, to understand the legal provisions as per various acts and report writing are also included.

Course Outcomes:

After completing the course, students will able to:

CO	Course Outcomes
CO1	Understand the field conditions and status of water availability and its equitable distribution and legal provisions for Ground water and surfacewater distribution
CO2	Derive an Unit hydrograph for various durations
CO3	Design various types dams and also check for the stability of these structures
CO4	Analyze and Design various components of Hydraulic structures
CO5	Write a report giving technical details

Detailed Syllabus: The term work shall consist of at least 5 exercises of following nature. Individual subject teacher shall have freedom of including additional exercises.

1	Report Writing- on the provisions of laws and Acts related to Water availability in different basins and its distribution, Maharashtra Ground Water Act and other relevant Acts.
2	Derivation Unit Hydrograph, Plotting Flood Hydrograph
3	Design of Gravity Dam by Single Step Method/ Multiple Step Method
4	Stability Analysis of Gravity Dams
5	Design and Stability Analysis of Earthen Dams
6	Design of Spillway (Ogee shape profile)
7	Design of Canal
8	Design of Cross Drainage Work
9	Design and Analysis of Weir on permeable foundation
10	A Detailed report of Field Visit preferably to a major Irrigation project

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPCC3006: Estimation, Costing and Valuation		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits:03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites:

Course description: The course deals with estimating quantities and probable expenditure on different buildings. The valuation of properties will also be taught in this course. Contracts, types of contracts as well as method of tendering will also be given.

Course Outcomes:

After completing the course, students will able to:

	Course Outcomes
CO1	Estimate the quantities for various civil engineering projects.
CO2	Compute rates for various items of construction.
CO3	Understand PWD procedure of execution of work and write the tender notice.
CO4	Compose valuation report for building and to draft specifications for any item of work.
CO5	Understand different type of contracts and accounting for any type of work.

Detailed Syllabus:

Unit 1	**Estimate:** Definition, importance of quantity surveying for civil engineer. Purpose, type of estimates, data required for estimates. Items of work, description of an item of work, unit of measurement & principles deciding the units, mode of measurement of building work. Abstracting, bill of quantities. Provisional contingencies, establishment charges, District Schedule of Rates (DSR), State Schedule of Rates (SSR). Introduction of IS: 1200 for modes of measurement.
Unit 2	**Analysis of Rates:** Factors affecting cost an item of work, materials, labour, tools, and plant, overheads and profit. Procedure of rate analysis. Task work-definition and factors affecting task work, transportation of material and cost Schedule of materials and labour. Taking out Quantities, Principles, and methods of taking out quantities for different item work.
Unit 3	**Methods of Executing Works:** Introduction, PWD procedure of execution of work, Administrative setup of PWD, administrative approval, technical sanction, budget provision, Technical Sanction, Different methods of execution of works in PWD. Introduction to registration as a contractor in the P.W.D. **Tenders:** Definition. Methods of inviting tenders, Types of tenders, tender notice, Pre-qualifications of contractor, tender documents, preparation of tenders. Submission in 3 bid/ 2 bid or single bid system. Qualitative and quantitative evaluation of tenders, comparative statement, pre- bid conference, acceptance of

	tenders, various forms of BOT tenders, global tendering. Schedule A, Schedule B, Schedule C.
Unit 4	**Valuation of Property:** Purpose, nature of value, different type of values, price, factors affecting value of a property. Free hold and leasehold property. Depreciation and methods of working out depreciation, sinking fund, years purchase, outgoings. Methods of valuation Land and building basis, Rental basis, Reproduction and replacement cost basis, Profit basis, fixation of rent. **Specifications:** Necessity and importance, purpose, drafting the specifications. Types of specifications. Legal aspect of specification.
Unit 5	**Contracts:** General idea, types of contracts, Engineering Procurement Construction (EPC). Conditions of contracts. FIDIC document, standard contract conditions published by Memorandum of settlement and Pro-forma invoice, Law of contract. Definition, objective & essentials of valid contract. Conditions of contract: General and Specific conditions. Settlement of disputes viz. dispute resolving board, arbitration, Concept of partnering. Different types of advances granted to the contractor. Various account forms, Liquidated damages defect liability period, retention money, termination of contract, payment, secure advance.

Text and Reference Books

1.Estimating and Costing in Civil Engineering: Theory and Practice, By: B.N Dutta Published By: S. Dutta & Company, Lucknow.
2.Estimating, Costing Specifications & valuation in Civil Engineering, By: M.Chakraborty Published By: Author.
3.Estimating and Costing By: G.S.Birdie
4.Estimating and Costing By: Rangwala Published By: Charotar Publishing House,Anand
5. Civil Engineering Contracts & Estimates By: B.S.Patil Published By: Orient Longman Ltd. Mumbai.
6. I.S.1200 (Part 01 to 25): Methods of Measurement of Building and Civil Engineering Works.
7. D.S.R: District Schedule of Rates
8. S.S.R: State Schedule Rates
9. PWD Hand Book and Red Book
10. Standard Contract Clauses for Domestic Bidding Contracts: Ministry of Statistics and Programme Implementation, Government of India.
11. FIDIC Document: Federation International Des Ingenieurs Conseils i.e. International Federation of Consulting Civil Engineers, Geneva, Switzerland.

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPCC3008: Lab-Estimation, Costing and Valuation		
Teaching Scheme	**Examination Scheme**	
Practical: 2 Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Perform to take out the quantities for various construction project.
CO2	Prepare estimates for various civil engineering work.
CO3	Calculate rates for various item of construction.
CO4	Draft specification and tender notice.
CO5	To prepare valuation report for residential building.

List of the Experiments

Sr. No.	**Title of the Experiments**
1	Working out Detailed Quantities for R.C.C building.
2	Estimation of quantities of concrete and steel reinforcement for structure in (i) above
3	Detailed Estimate of Residential Drainage and Water Supply Project
4	Writing detail specifications of any two items Work from exercise 1
5	Analysis of Rates: For the two Items of Works in exercise 1 based on the prevailing market rates of various items and labour involved.
6	Working out total cost of the building as per SSR.
7	Preparation of draft of tender notice, preparing valuation reports of a residential building.

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPEC3008: Ground Improvement Techniques		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits:03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: **CEPCC3002 Geotechnical Engineering**

Course description: This course introduces different Ground Improvement Techniques such as Vibratory compaction, densification, grouting, reinforcement mechanism, and design with geo-synthetics.

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

	Course Outcomes
CO1	Improve ground conditions by excavation and replacement.
CO2	Improve ground conditions by Vibratory compaction in sands and vibro-flotation in clays.
CO3	Select methodologies to be adopted for particular ground improvement technique.
CO4	Implement densification, grouting, reinforcement mechanism, and design with geo-synthetics.

Detailed Syllabus:

Unit 1	Ground Improvement and Modification: New technologies, Relative costs, Processes of modification and their influence on soil, Improving by excavating and replacing, In-Situ ground improvement, Design methodology.
Unit 2	In-Situ Densification of Soils: Response of sands and clays to externally applied stress, Compaction piles in sands, Impact compaction of sands, Vibratory compaction in sands, Explosion in sands, Comparison of in situ densification methods in sands, Vibro-flotation in clays, Accelerated pre-consolidation in clays.
Unit 3	Grouting in soils: Types of grouts, Desirable characteristics of grouts, Grouting methods, Permeation grouting, Grouting pressure, technology, and arrangements, Displacement- compaction grouting, Displacement-soil fracture grouting, Jet or replacement-displacement grouting.
Unit 4	Reinforced Soil: The mechanism, Reinforcement-soil interaction, Applications, Reinforced soil structures with vertical faces, Reinforced soil embankments, Open excavation using soil nails, Reinforcement of soil beneath unpaved roads and foundations.
Unit 5	Geo-synthetics: A manmade product, Why geo-synthetics? Types of geo-synthetics, Functions of geo-synthetics, Properties of geo-synthetics, Functional requirements, Designing with geo-synthetics

References:

1. M. R. Hausmann, “Engineering Principles of ground Modifications”, McGraw-Hill International.
2. M. P. Moseley,” Ground Improvement”, Blackie Academics and Professionals.
3. P. P. Xanthakos, L. W. Abramson and D. A. Bruce, “ Ground Improvement and Control”, John Wiley & Sons.
4. R. H. Manfired, “Engineering Principles of Ground Modifications”, McGraw-Hill.,
5. Dr. P Purushothama Raj, “Ground Improvement Techniques”, Laxmi Publications, New Delhi.
6. S. K Gulati and Manoj Datta, “Geotechnical Engineering”, Tata McGraw Hills Publications, New Delhi.

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher’s Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPEC3009: Open Channel Hydraulics		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs./ week	**ISE I**	**15 Marks**
Credits:03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Nil

Course description: The design the open channel plays an important role in the irrigation planning and management. This course covers the concepts, analysis and design of the open channel considering sediment transport.

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Compute the discharge through open channels.
CO2	Select and use the discharge measuring devices in uniform flow
CO3	Analyze and design the channel for required discharge for gradually varied flow
CO4	Compute the depth of flow, energy dissipation, surface profile & discharge measuring devices
CO5	Understand about Sedimentation.

Detailed Syllabus:

Unit 1	**Principles of Hydraulics of Open Channels**, Channel geometric characteristics, Pressure distribution, Velocity distribution, Classification of flow in open channel, Computation of discharge, most economical rectangular and trapezoidal section, design of open channel.
Unit 2	**Uniform Flow** Introduction, Chezy Equation, Darcy–Weisbach Friction Factor, Manning's Formula, Equivalent Roughness, Uniform Flow Computations Non uniform flow, specific energy curve, alternate depths, computation specific energy and discharge, specific force.
Unit 3	**Introduction to Gradually Varied Flow**, Differential Equation of GVF, Classification of Flow Profiles, Features of Flow Profiles, Gradually Varied Flow Computations
Unit 4	**Rapidly varied flow**, Hydraulic jump, Computation of depth of flow, energy dissipation works, Discharge measuring devices.
Unit 5	**Sedimentation:** Sediment transportation through channels, Origin and classification of Sediment, measurement of sediment load.

Text and Reference Books

1. Subramanya K. (1998), "Flow in Open Channels", Tata McGraw Hill Publishing Co
2. Chow V.T. (1979), "Open Channel Hydraulics", McGraw Hill Inc., New York
3. Garde R, J. and Ranga Raju K.G. (1980), "Mechanics of Sediment Transportation and Alluvial Stream Problems, Wiley Eastern Limited
4. French R.H. (1986), "Open Channel Hydraulics", McGraw Hill Publishing Co., New York
5. Bansal R.K. (2013), "A Text Book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPEC3010: Air Pollution and Control		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisite: NIL

Course Description:
Air pollution occurs due to particulate pollutants or gaseous pollutants introduced into Earth's atmosphere. It may cause adverse effects on human being, plants, animals and property. Human activity and natural processes can both generate air pollution. Primary pollutants are usually produced from a process, while secondary pollutants are formed in the air when primary pollutants react or interact. There are various air pollution control technologies and strategies available to reduce indoor as well as outdoor air pollution. This course helps to students to identify the need of control of air pollution and methodologies to be adopted to control air pollution.

	Course Outcomes
CO1	Understand the influence of weather and climate on air pollution and interpret air quality data
CO2	Identify air pollutants, understand sampling methods and apply analytical techniques to assess air quality
CO3	Evaluating air quality and designing control system
CO4	Understand the legal framework and regulatory mechanisms for controlling air pollution
CO5	Understanding the role of EIA in mitigating air pollution impacts on environment

Detailed Syllabus:

Unit 1	**Meteorological Aspects:** Zones of atmosphere, Scales of meteorology, Meteorological parameters, Temperature lapse rate, Plume behavior, Plume rise & plume dispersion. Gaussian Dispersion model for finding ground level concentration. Formulae for stack height and determination of minimum stack height
Unit 2	**Air Sampling and Analysis**: Air pollution survey, basis and statistical considerations of sampling sites, devices and methods used for sampling gases and particulars. Stack emission monitoring, stack height, bloom behavior, isokinetic sampling. Analysis of air samples chemical and instrumental methods. Ambient air quality monitoring. Causes and effects of air pollution on plants, human being, animals and property, sources and effects of indoor air pollutants, changes in indoor air quality, control of indoor air pollutants and air cleaning systems.

Unit 3	**Control of Air Pollution:** Modification, change of raw materials, fuels, process equipment and process operation. By use of air pollution control equipment for particulate and gaseous pollutants. Design of control equipment Settling chamber, Cyclone, Fabric filter, Electrostatic precipitator and Wet scrubber. Control of air pollution from automobiles.
Unit 4	**Legislation and Regulation:** Air (Prevention and Control) Pollution Act, 1981. The Environment (Protection) Act 1986 in context with air pollution. Pollutant Emission standards for stationary and mobile sources. National Ambient Air Quality Standards and Air Quality Index

Text and Reference Books

1) H. V. N.Rao and M. N. Rao, 'Air Pollution', Tata McGraw – Hill Publishing Company Limited
2) C. S. Rao, 'Environmental Pollution Control Engineering' Wiley Eastern Limited, New Age International Limited Publication
3) Bare Act 'The Environment (Protection) Act, 1986'.
4) Crawford, 'Air Pollution Control Theory', Tata McGraw-Hill Publishing Company Ltd
5) Santosh Kumar Garg,'Sewage Disposal and Air Pollution Engineering' Khanna Publishers

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPEC 3011 : Advanced Transportation Engineering		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: CEPCC 3001 Transportation Engineering

Course description: This course introduces planning of transportation system, latest transportation technology in urban areas, transport economics and financing, traffic systems and study of different types of pavements and Overlays.

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Implement the transport planning system.
CO2	Interpret the methods of urban transport technology
CO3	Understand transport economics and financing
CO4	Identify different traffic systems
CO5	Design flexible and rigid pavements

Detailed Syllabus:

Unit 1	**Transport Planning:** Transport Guidelines and Policy, process, and types of surveys. OD matrix. Travel demand forecasting, trip generation, modal spilt analysis, trip distribution, route assignment analysis, Transport Networks, network flow analysis.
Unit 2	**Urban Transport:** Classification, mass and rapid transit system, Introduction to Intelligent Transportation System (ITS), Introduction to Advanced Transport Management System (ATMS), Public Transport policy. Introduction to BRT, Mono rail, sky bus, metro projects, and grade separated interchanges such as flyovers, underpasses, overpasses, concept of Integrated Inter Model transit system.
Unit 3	**Economics for Transport:** Vehicle operations cost, running cost, pollution cost, value of travel time, road damage cost, congestion cost, accident cost economic evaluation, various economic studies. Transportation plans - Benefit cost method, Net present value method, First year rate of return method, Internal rate of return method & comparison of various methods. Pavement management systems.
Unit 4	**Traffic Systems:** Traffic impacts, traffic studies, level of service, traffic analysis process, basic traffic theory, intersection studies, turning movements, flow, delays, and queuing, signal design, grade separated intersection, parking studies, Traffic generation and parking, parking demand surveys and requirements, parking facilities, Parking design, instrumentation of traffic monitoring. Street Light Designing.
Unit 5	**Flexible Pavement:** Highway pavements and airport pavements, Flexible pavements studies, performance studies, surface characteristics of pavements,

	profile measurements, pavement unevenness, skid resistance, its measurements, IRC, pavements failure, maintenance and drainage. Freezing of soil, etc. Strengthening of pavement - Benkelman beam method. Distresses in Pavements. **Rigid Pavement**: Concept of rigid pavement, comparison of rigid pavement over flexible pavement, Stress distribution in layered media, one and two layered system, joints in rigid pavement, longitudinal construction joints, design as per IRC guidelines, design of joints, dowel bars, design of white topping and overlay design, temperature reinforcement, pavement failure, maintenance strategy strengthening of rigid pavement, types of overlays, flexible over rigid, rigid over rigid, mechanization in pavement construction.

Text and Reference Books

1. The Design and Performance of Road Pavements - David Croney, Paul Croney.
2. Understanding Traffic System -Michel A Taylor, William Young, PeterWBonsall.
3. Principles of Urban Transport Systems Planning - B. Hutchinson.
4. Introduction to transport planning - M. J. Burton.
5. Transport Networks - Potts Oliver (Academic Press).
6. Modem Construction Equipment and methods- Frank Harries.

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPEC3012: Civil Engineering Laws		
Teaching Scheme	**Examination Scheme**	
Lectures: 04 hrs./ week	**ISE I**	**15 Marks**
Credits: 4	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Nil

Course description: In this course, students will learn about Ethics of Engineers, Judiciary system, various laws such as labour law, contract law & environmental law that applicable in every industry / Employees working organization. If students will complete this course, then they will definitely know about useful laws that help grow there's health, wealth and life while working in any organization's

Course Outcomes:
After completing the course, students will able to:

	Course Outcomes
CO1	Justify the professional ethics, moral standards & Describe role of judiciary system
CO2	Understand labour law & its compliance
CO3	Define legal aspects of construction industry
CO4	Fundamental understanding of concepts of contract law & know about important articles
CO5	Study about environmental laws that's applicable for construction industry

Detailed Syllabus:

Unit 1	**A) Code of Ethics for Engineers** Def. history, Fundamental principle, Rules of practice, Professional obligations, Scope & Aim of engg ethics, Ethics & Responsibility of engineers, impediments to responsibility, risks, safety & liability of engineers, code of conduct of different engineering organization. **B) Indian judiciary system.** Supreme court of India, High court, District court, Subordinate courts, Labour courts.
Unit 2	**A) Labour Laws** Introduction, History, Necessity, Important of labour laws. Not compatible with current working condition **B) Major labour Compliance Rules: -**Child labour Act, Building & other construction workers (Regulation of employment & condition service) Act- 1996, Minimum wedges Act-1948, Contract labour Act-1948, Equal remuneration Act-1976, Payment of wages Act-1936, Workers' compensation Act-1923, Payment of bonus Act-1965, Employees state insurance
Unit 3	**Legal Aspects & Laws Applicable to construction Industry** Work Contract Act, Factories Act – 1948, Mines Act 1952, Industrial employment (standing order) Act- 1946, Indian industrial disputes Act-1947, Sexual harassment of women at workplace Act-2013, Maternity benefit Act-1961, Employees provident fund, Collective bargaining, The Interstate migrant workman (Regulation of employment & condition service) Act-1979

Unit 4	**Contract Law:** -The Indian contract Act of 1872, Def. history, offer & Acceptance, Amendments, Framework for disputes, Quasi-contracts, **Some important sections of the Indian Contract Act, 1872 include:** -Section 2, Acceptance Section 2(b), Section 2(g), Section 5, Lawful consideration Section 10, Section 13 Free and fair consent, Section 17, Section 24–30 and 56, Section 27, Section 74, Consequences of breaking a contract, Quasi-contracts.
Unit 5	**A) Environment & Waste Disposal:** -Environment protection Act-1986, Forest protection Act-1980, Hazardous waste management Act Rules-1993 **B) Environmental Law in India:** -Environmental legislation, Air, Water & Environmental Acts, National Environmental Policy

Text and Reference Books

1.C.S.V. Murthy, Business Ethics -Himalaya Publishing House
2.The Constitution of India, Bare Act with Short Comments-Published by Professional Book Publications, Delhi.
3.Universals Labour and industrial laws Manual Big size latest 2024 Edition LexisNexis
4.P.L. Maliks handbook of LABOUR & INDUSTRIAL LAW
5.Practical Guide to LABOUR LAWS with commentaries & legal draft by J.N. PUTATUNDA in Association with J DHAR
6. Bare Act of The Indian Contract Act 1872, (2020 Edition)
7. Laws of Contract 1&2 by Dr.S.S. Srivastava
8.A Rosencranz, S, Diven, M.I. Noble, Environmental Law and policy India cases, Materials and statutes, Tripathi Pvt.Ltd, Bombay.
9. S. Musharaf, Legal aspects of Environmental Pollution and its Assessment, McGraw Hill Inc, NY.

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class**.**

AMPEC 3006: Design of Advanced Steel Structure		
Teaching Scheme	**Evaluation Scheme**	
Lectures : 3 Hrs/Week	**ISE-I**	**15 Marks**
Credits: 3	**ISE-II**	**15 Marks**
	ISE-III	**10 Marks**
	End-Semester Examination	**60 Marks**

Prerequisite: AMPCC 3001 Design of steel structure.

Course Description:

This course is intended to provide students comprehensive knowledge on the design of steel structure. The course focuses on the five topics shown in detail syllabus.

Course Outcomes: After successful completion of the course, students will be able to:

	Course Outcomes
CO1	Analyze and design industrial building (shed).
CO2	Understand the concept of designing Pre-engineered buildings
CO3	Understand the concept of design in light gauge steel.
CO4	Analyze and design of gantry girders
CO5	Understand the concept of analysis and design of steel tanks

Detailed Syllabus:

Unit 1	**Design of Industrial Buildings (shed) :** Introduction, selection of roofing and wall material, selection of bay width, structural Framing (Knee bracing of column, Un-braced frame), type of trusses and truss configuration, pitch of truss, depth of truss, spacing of purlin, loads on truss, load combinations, Design of truss members, problems on design of industrial truss.
Unit 2	**Design of PEB Structure:** Introduction to PEB, advantages over conventional steel structure, Component parts of PEB structure, Design of PEB frame.
Unit 3	**Light Gauge Steel (Cold-form steel) :**Introduction to cold-form steel, Type of cold-form section, local buckling, stiffened compression element, Multiple stiffened elements, Un-stiffened compression element, compression members, laterally supported flexural Members.
Unit 4	**Gantry Girder: -** Introduction to gantry girder, loading consideration**,** maximum load effect, fatigue effect, selection of section for girder, column, bracing, design steps, Design gantry girders.
Unit 5	**Design of steel Tanks:-** Introduction, Types of steel Tanks, Rectangular water, stand pipes, stresses in stand pipes, Design of anchor bolts for stand pipes, Elevated circular steel tank, Riveted joint in elevated circular steel tanks, Accessories of elevated circular steel tank, Forces acting on the circular tank, Stresses in elevated circular steel tanks, staging for circular steel tanks, stresses in columns, wind bracing.

Text and Reference Books

1. S.K. Duggal – Design of Steel Structures- Tata McGraw Hill.
2. Ramchandra – Design of Steel Structures Vol – II, Standard Book House, Delhi
3. A.S. Arya and J.L. Ajmani – Design of Steel Structures, Nemchand & Bros., Roorkee
4. Comprehensive Design of Steel Structures, B.C.Punmia, A. K. Jain ,Laxmi Publications(P)Ltd, New Delhi
5. N. Subramanian -Design of steel structure- Oxford University Press,
6. N. Krishna Raju - Design of Bridges, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
7. Teaching Resource for Structural Steel Design – INSDAG Kolkata
8. IS: 800:1984 Code of Practice for General Construction in Steel
9. IS: 875: 1964 Code of Practice for Structural Safety of Building: Loading Standards (Revised)
10. IS: 4137: 1967 Code of practice for Heavy Duty electric Overhead Traveling Crane

Assessment:

ISE I: Based on unit I and unit II
ISEII: Based on unit III and unit IV
ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Simulation
2. Application development
3. Power point presentation of case studies
4. Question & answer / Numerical solution
5. Study of Industry processes and its presentation
6. Mini projects
7. Attendance in the class

CEPEC3013: Lab- Ground Improvement Techniques		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Understand the problems on site and to design feasible ground improvement and modification technique
CO2	Improve ground conditions by densification and grouting
CO3	Improve ground conditions by use of geo-synthetics and geo-grids
CO4	Understand real life ground improvement problems with site visits

List of the Assignment:

Sr. No.	Title of the Experiments
1	Assignment on Ground Improvement and Modification.
2	Assignment on In-Situ Densification of Soils.
3	Assignment on Grouting in soils.
4	Assignment on Reinforced Soil.
5	Assignment on Geo-synthetics.
6	Assignment on Geo-grids.

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPEC3014: Lab – Open Channel Hydraulics		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Examination**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Experience the theoretical concepts through the experimentation
CO2	Calibrate the measuring devices and use of output for analysis and design.
CO3	Calculate flow characteristic's for gradually varied flow and rapidly varied flow
CO4	Calculate discharge

List of the Experiments

The student shall perform minimum eight experiments of the following using MATLAB/ MIPOWER/PSCAD

Sr. No.	Title of the Experiments
1	Measurement of Velocity of flow using pitot tube, current meter.
2	Measurement of discharge through open channel using weirs.
3	Measurement of discharge through open channel using notches.
4	Measurement of discharge over spillway.
5	Determination of efficiency of Hydraulic jump
6	Design of channel, Design of Economic section of channel.
7	Measurement of Sediment load.
8	Field visit Report.

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPEC3015: Lab- Air Pollution and Control		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Examination**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Identify and classify sources of air pollution and their impact on the environment.
CO2	Measure and analyze air pollutants using standard methods.
CO3	Evaluate the effectiveness of air pollution control techniques and monitoring stations.
CO4	Assess the impact of air pollution on human health and the environment.
CO5	Apply knowledge to suggest mitigation strategies for air pollution control.

List of the Experiments

Sr. No.	**Title of the Experiments**
1	Report on sources of Air Pollution Along with its classification for a specific area(case study)
2	Measure lapse rate using simple Thermometer.
3	Calculate the Stack height using empirical formulas.
4	Conduct Air sampling without advanced equipment.
5	Analyze particulate matter using High Volume Air Sampler
6	Conduct an EIA based on secondary data.
7	Understand the impact of greenhouse gases and public involvement in policy.
8	A report based on site visit to Air Pollution Monitoring Station or Air Pollution Control Equipment.

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on oral / practical examination conducted by the course coordinator and external examiner

CEPEC 3016: Lab - Advanced Transportation Engineering		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs/Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After completion of this course students will be able to:

	Course Outcomes
CO1	Understand and analyze transport planning elements and urban transport systems
CO2	Understand principles of economic evaluation for transport projects
CO3	Perform traffic data collection and analyze intersection performance
CO4	Identify pavement distresses and propose design/maintenance solutions

List of the Experiments

The student shall perform minimum eight experiments of the following:

Sr. No.	Title of the Experiments
1	Write assignment on Origin-Destination (OD) Matrix, Modal Split Analysis, and network flow analysis in detail.
2	Visit to a Transport Planning Authority Office (like RTO, MRDC private limited).
3	Write a report on Grade Separated Interchange (flyover or underpass) for a city intersection.
4	Classification of Urban Transport Systems – Case study comparison.
5	Write a case study on Intelligent Transport Systems (ITS) implementation in any city.
6	Compare First-Year Rate of Return vs NPV Method numerical on any sample project.
7	Write a report on Turning Movement Count and Manual Traffic Volume Count at an intersection and classification by vehicle type.
8	Write assignment on Parking demand planning (on street & off-street parking)
9	Identification of Pavement Failures and Maintenance Strategy Planning

10	Write assignment on the Reinforcement Detailing for Rigid Pavement Sections with diagram in detail.

Assessment:

ISE III: The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity
b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment shall be based on attendance, students, performance, and submission of files.

AMPEC3007: Lab - Design of Advanced Steel Structure		
Teaching Scheme	**Examination Scheme**	
Practical: 2Hrs / Week	**ISE III**	**25 Marks**
Credits:01	**End Semester Evaluation**	**25 Marks**

Course Outcomes:

After successful completion of the Lab., students will be able to:

	Course Outcomes
CO1	Identify design principles and IS code specifications.
CO2	Design industrial shed and gantry girder
CO3	Design special structures like PEB structures & water tank

List of the Experiments (Any three of the following)

Sr. No.	**Title of the Experiments**
1	Design the various component of industrial building and prepare its detailed drawings.
2	Design of a PEB shed and prepare its working drawings.
3	Determining load carrying capacity of cold-form (light gauge) members of various shape and size.
4	Design and preparation of detailed drawings of gantry girder
5	Design and preparation of detailed drawings for steel water tank

Assessment:

ISE III The assessment is divided in two parts

a) It will be based on the term work and interaction with the students till 50% coverage of the activity

b) It will be based on assessment of final submission of the term work and interaction with the students at the end of the term

ESE: The assessment will be based on oral / practical examination conducted by an External examiner appointed by the Institute and course coordinator

CEMDM5006: Transportation Infrastructure and Smart Technologies		
Teaching Scheme	**Examination Scheme**	
Lectures: 03 hrs/ week	**ISE I**	**15 Marks**
Credits: 03	**ISE II**	**15 Marks**
	ISE III	**10 Marks**
	End Semester Examination	**60 Marks**

Prerequisites: Nil

Course description: This course introduces the fundamental elements of transportation infrastructure, including roads, railways, bridges, airports, docks, harbors, and tunnels. It covers the properties of materials, various material mixes, and mix design methods. The course also introduces the application of Artificial Intelligence (AI) and Machine Learning (ML) in traffic engineering, pavement performance prediction, accident analysis, and intelligent transport systems (ITS), enabling students to understand modern data-driven transportation solutions.

Course Outcomes:

After successful completion, students will be able to:

	Course Outcome
CO1	Understand highway alignment, geometric design, pavement construction, and road safety.
CO2	Understand material properties, mix design, pavement failures, maintenance, and strengthening methods.
CO3	Learn traffic studies, accident analysis, public transport integration, traffic regulations, and how AI/ML techniques enhance data interpretation and traffic modeling.
CO4	Implement and understand the bridge construction process with data-supported decision-making tools.
CO5	Learn railway, airport, seaport, and tunnel infrastructure planning and management with insights into how AI and smart technologies are transforming operations.

Detailed Syllabus:

Unit 1	**Geometric Design and Pavement** Importance & Modes of Transportation, Highway Alignment & Surveys, Geometric Design: Cross-sectional elements, Sight Distance, Alignments, Interchanges, Pavement Design (Flexible & Rigid), Construction Joints, Failures, Sustainable Transportation Planning, Highway Capacity Analysis, Introduction to AI for Pavement Condition Monitoring, Smart Sensors and Real-time Data for Road Safety Enhancement, Case Studies: AI in Road Maintenance Forecasting
Unit 2	**Material Properties, Mix and Pavement Design** Properties of materials, quality control issues, Mix design using the Marshall Method, Strengthening of Pavements and Overlay Design (IRC(Indian Road Congress) Guidelines), Economic Evaluation and Financing, Machine Learning for Pavement Performance Prediction, Data-driven Quality Control in Material Mix Design
Unit 3	**Traffic Engineering**

	Traffic Theory: Volume counts, OD(Origin Destination) surveys, Speed-delay, Parking, Accident Studies, Traffic Monitoring Instrumentation, Public Transport Integration and Enforcement, AI Applications in Traffic Flow Prediction and Congestion Management, ML Techniques in Accident Hotspot Identification and Crash Analysis, Intelligent Transportation Systems (ITS): Overview and AI Role
Unit 4	**Bridges** Bridge Classification, Site Selection, Hydrology, and Subsurface Investigations, Design Data Collection, Scour and Foundation Depth, River Training, Load Calculations, Bridge Super- & Substructure, AI-assisted Load Estimation and Structural Health Monitoring of Bridges, Case Study: Predictive Maintenance Using ML Algorithms
Unit 5	**Rail, Airport, Docks and Harbours** Rail Components, Design, Yards, Track Maintenance, Airport Planning: Runway and Apron Design, Drainage, Seaport Planning: Docks, Harbors, Berthing, Port Operations, AI in Railway Scheduling and Optimization, ML for Air Traffic Prediction and Runway Utilization, Automation and AI in Port Management and Maritime Logistics

Text and Reference Books

8. S.P. Bindra, "Dock and Harbour"
9. Srinivasan, "Docks and harbour" Charotar publishing house pvt. ltd, Ananad Gujrat
10. C.E.G. Justo& S.K. Khanna, "Highway Engineering"
11. Partha Chakraborty and Animesh Das, "Principles of Transportation Engineering"
12. Ministry of Road Transportation &Highways Specification of road and bridges -2001 Govt. of India, New Delhi
13. S. K. Khanna, M.G. Arora & S.S. Jain, "Airport Planning and Design"
14. Yang H. Huang, "Pavement Analysis and Design"
15. Ghosh & Das, "Artificial Intelligence in Transportation"
16. Rao, K.S., "Machine Learning Applications in Transportation Engineering"

Assessment:

ISE I: Based on unit I and unit II

ISEII: Based on unit III and unit IV

ISE III: Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following

8. Simulation
9. Application development
10. Power point presentation of case studies
11. Question & answer / Numerical solution
12. Study of Industry processes and its presentation
13. Mini projects
14. Attendance in the class

CEVSE3001: Software For Civil Engineering		
Teaching Scheme	**Examination Scheme**	
Practical: 04 hrs/ week	**ISE III**	**50 Marks**
Credits: 2	**End Semester Examination**	**-**

Prerequisites: NIL

Course description: This course provides hands-on training in civil engineering software for drafting, structural analysis, GIS, and infrastructure design. Students will learn 2D & 3D building drafting and structural detailing using CAD tools. They will also learn to analyze beams, RCC frames, roads, and water distribution networks using industry-standard software. GIS applications will be explored for land-use mapping and infrastructure planning. The course also covers pipe surge analysis, sewer network design, and building estimation. Additionally, students will develop skills in construction management and project planning for real-world applications.

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

	Course Outcomes
CO1	Develop analysis and designing using CAD for 2D & 3D including beams, RCC frames, steel structure of building and its detailing.
CO2	Design roads and utilize GIS tools for land-use mapping, pipe distribution networks, pipe surge analysis, and sewer network design using industry-standard software.
CO3	Estimate the building quantities and its rate analysis, project management and construction planning.

Detailed Syllabus:

The choice of software for this course lies with the Course Coordinator. Depending on the requirements of the curriculum and availability, the Course Coordinator may opt to use either open-source software or licensed software.

The term work shall consist of at least 7 exercises of following nature.

1	2D & 3D Drafting–Building Plan & Elevation using CAD/ Revit
2	Analysis of a Steel structure using STAAD. Pro/ ETABS software
3	Analysis of a Simple RCC Frame Structure using CAD/ STAAD. Pro/ RAM Structural System software
4	Analysis of Roads design using open roads designer software
5	Introduction to GIS using ArcGIS

6	Design of Pipe Distribution Network and Sewer distribution Network using WaterGEMS and Sewer GEMS
7	Pipe Surge Analysis Open flow HAMMER/ Auto PIPE (2018)
8	Estimation of Building quantities using Clear estimates software
9	Construction Management and Planning using Building Information Modelling software

Assessment:

ISE III shall be based on the assessment of submission work and interaction with student till end of the term.