

**Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)**  
**SCHEME OF STUDIES & EXAMINATIONS**  
**B.Tech. 3<sup>rd</sup> YEAR (SEMESTER – V: CIVIL ENGINEERING)**  
**Tentative Choice Based Credit Scheme w.e.f. 2020-21**

S. No.	Course No.	Course Title	Teaching Schedule			Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P		Theory	Practical			
1	CE301C	DESIGN OF STEEL STRUCTURES – I	3	1		25	75	-	100	4	3
2	CE 303C	STRUCTURAL ANALYSIS - II	3	1		25	75	-	100	4	3
3	CE305C	REINFORCED CONCRETE DESIGN –I	3	1		25	75	-	100	4	3
4	CE307C	CONSTRUCTION ENGINEERING AND MANAGEMENT	3	-		25	75	-	100	3	3
5	CE309C	GEO-MECHANICS	3	1		25	75	-	100	4	3
6	CE 311C	TRANSPORTATION ENGINEERING - II	3	-		25	75	-	100	3	3
7	CE	DE – I (SP)	4	-		25	75	-	100	4	3
8	HUM301C	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	3	-		25	75	-	100	-	3
9	CE313C	REINFORCED CONCRETE DESIGN – I LAB	-	-	2	25		75	100	1	3
10	CE315C	GEO-MECHANICS LAB	-	-	2	25		75	100	1	3
11	CE317C	SURVEY CAMP*	-	-	2*	25		75	100	1	3
<b>Total</b>			<b>25</b>	<b>4</b>	<b>6</b>	<b>275</b>	<b>600</b>	<b>225</b>	<b>1100</b>	<b>29</b>	

MOOC Geo-environmental Engineering (Environmental Geotechnology): Landfills, Slurry Ponds & Contaminated Sites

**Note:**

- 1 The students will be allowed to use non-programmable scientific calculator. However, sharing/exchange of calculator are prohibited in the examination.
- 2 Electronics gadgets including Cellular phones are not allowed in the examination
- 3 \* Assessment of survey camp held after fourth semester.
- 4 DE-I (SP) For only those students opting for degree with specialization
- 5 Student can undertake 20% of the courses of this scheme (Hons./Minor Degree with Specialization in the listed emerging areas) through online platforms SWAYAM/MOOCs/NPTEL etc. with due permission of the chairperson.
- 6 Any students of the B. Tech. of the University can opt for this scheme (Hons./Minor Degree with Specialization in the listed emerging areas), however, minimum 10 students are required for running a particular specialization.

**Subject: DESIGN OF STEEL STRUCTURES I**  
**Subject Code:CE301C**

**L T P Credits**  
**3 1 -- 4**

**Class Work : 25 Marks**  
**Examination : 75Marks**  
**Total : 100 Marks**  
**Duration of Examination : 3 Hours**

**USE OF RELEVANT INDIAN STANDARD IS ALLOWED IN THE EXAMINATIONS.**

**Course Outcomes :**

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

CO1	Apply the IS codes of practice for the design of steel structural elements.
CO2	Analyze and design the behavior of various connections for both axial and eccentric forces.
CO3	Design of compression and flexural members using simple and built-up sections.
CO4	Analyze and design of column bases, tension members and gantry girder.

**Prepare CO-PO/PSO Articulation Matrix, e.g.:**

	PO1	PO2	PO3	PO4	PO6	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2	1	1	2	2	1	3
CO2	3	2	2	1	1	1	1	1	-	2	2	2
CO3	3	2	1	2	-	2	2	2	2	2	3	3
CO4	2	1	2	1	1	1	1	1	1	2	2	2

**UNIT I**

Topic no 1 Introduction: Steel as Structural Material, Advantages and disadvantages of steel  
 Topic no 2 Types of sections, Loads and combinations, design approaches—elastic and limit state methods Indian standards codes  
 Topic no 3 Connections: Importance, various types of connections, Advantages and disadvantages of welded and bolted joints  
 Topic no 4 design of bolted connections, efficiency and design of joints, design of welded connections.

**UNIT II**

Topic no 5 Eccentric connections: Types of eccentric connections, Bolted and welded connections, Load lying in plane of joint,  
 Topic no 6 Load lying perpendicular to the plane of joint, Design of bolted and welded connections.  
 Topic no 7 Tension Members: Types of failures, gross and net sectional areas, rupture of critical section, strength calculation  
 Topic no 8 block shear failure, slenderness ratio, design of tension members, lug angles and tension splices  
 Topic no 9 Design of tension member subjected to axial and bending.

**UNIT III**

Topic no 10 Compression Members: Types of failures, strength calculation, effective length and slenderness ratio, design of compression member  
 Topic no 11 design of built up compression member, laced and battened columns including the design of lacing and plate.  
 Topic no 12 Flexural Members: Introduction to flexural members, Design criteria, permissible stresses, laterally supported beams  
 Topic no 13 their design, laterally unsupported beams and their design, Built-up beams, design of purlins

**UNIT IV**

Topic no 14 Column Bases: Introduction, types of column bases, design of slab base and gusseted base,  
 Topic no 15 Design of gusseted base subjected to eccentrically loading  
 Topic no 16 Plate Girders: Introduction, weight and economic depth, design of flanges, design of web  
 Topic no 17 Curtailment of flange plates, intermediate and bearing stiffeners.

**Text Books**

1. Design of Steel Structures, Dr. Subramanian Narayanan, oxford publication.
2. Limit state design of Steel Structures, by S K Duggal, Tata McGraw Hill.

**Reference Books**

1. Design of Steel Structures, P. Dayaratnam, Wheeler Publishing, New Delhi.
2. Design of Steel Structures, M. Raghupathi, Tata McGraw Hill, New Delhi.

NOTE: 1.For the semester examination, nine questions are to be set by the examiner. Question no. 9, containing 5-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 9. All questions will carry equal marks.

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**Subject: STRUCTURAL ANALYSIS – II**  
**Subject Code: CE303C**

**L    T    P    Credits**  
**3    1    --    4**

**Class Work                    : 25 Marks**  
**Examination                 : 75Marks**  
**Total                            : 100 Marks**  
**Duration of Examination    : 3 Hours**

**Course Outcomes :**

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

CO1	Apply the basic concepts of matrix methods in structural analysis.
CO2	Analyze the behavior of beams and frames during uneven support settlements.
CO3	Understand the concept of space frames and its equilibrium conditions
CO4	Identify the different load conditions for analyzing the multistory frames subjected to vertical and lateral loads.

**Prepare CO-PO/PSO Articulation Matrix, e.g.:**

	PO1	PO2	PO3	PO4	PO6	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	1	1	2	2	3	2
CO2	3	2	2	2	1	1	2	1	2	2	3	2
CO3	3	3	2	2	1	1	2	2	2	2	3	2
CO4	2	3	2	2	1	1	1	1	1	2	3	2

**UNIT – I**

- Topic no 1 Introduction: Introduction to matrix algebra
- Topic no 2 systems approach: force and displacement methods and their comparison
- Topic no 3 Relationship between force method
- Topic no 4 displacement method, Design examples

**UNIT – II**

- Topic no 5 Slope and Deflection Method: Introduction, slope-deflection equations, analysis of statically indeterminate
- Topic no 6 beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements.
- Topic no 7 Moment Distribution Method: Introduction, absolute and relative stiffness of members, stiffness
- Topic no 8 carry-over factors, distribution factors, analysis of statically indeterminate beams and rigid frames (sway and non-sway type)
- Topic no 9 due to applied loads and uneven support settlements, symmetrical beams
- Topic no 10 frames with symmetrical, skew-symmetrical and general loading.

**UNIT – III**

- Topic no 11 Kani’s Method: Introduction, basic concept, analysis of statically indeterminate beams and rigid frames
- Topic no 12 (sway and non-sway type) due to applied loadings and yielding of supports, symmetrical beams and frames
- Topic no 13 general case- storey columns unequal in height and bases fixed or hinged.
- Topic no 14 Approximate Analysis of Frame: Vertical and lateral load analysis of multistory frames, portal, cantilever
- Topic no 15 substitute-frame methods and their comparison

**UNIT – IV**

- Topic no 16 Space Frames: Introduction, simple space truss, types of supports, equilibrium and stability conditions
- Topic no 17 analysis of determinate and indeterminate space frames using tension coefficient method.
- Topic no 18 PLASTIC ANALYSIS: Basics of plastic analysis, static and kinematic theorems for plastic analysis of beams and frames.

## REFERENCE BOOKS

1. Indeterminate Structural Analysis C K Wang Tata McGraw Hill

## TEXTBOOKS :

1. Basic structural analysis - C.S. Reddy
2. Structural Analysis- Thandvamoorthy TS Oxford University Press
3. Structural Analysis - Devdas Menon Narosa Publishing House

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**Subject: REINFORCED CONCRETE DESIGN – I**

**Subject Code: CE 305C**

**L    T    P    Credits**  
**3    1    --    4**

**Class Work                               :   25 Marks**  
**Examination                               :   75Marks**  
**Total   :   100 Marks**  
**Duration of Examination               :   3 Hours**

**USE OF RELEVANT INDIAN STANDARDS IS ALLOWED IN THE EXAMINATIONS**

**Course Outcomes :**

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

CO1	Understand design philosophies used in the design of RCC.
CO2	Apply Indian Standards codal provisions correctly.
CO3	Design Different types of beams, slabs and footings.
CO4	Design columns subjected to axial loads and also subjected to moment.

**Prepare CO-PO/PSO Articulation Matrix, e.g.:**

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

**UNIT I**

Topic No 1 Working Stress Design Method :Introduction, Assumptions, derivation of design constants, problems on computation of moment of resistance, determination of stresses

Topic No 2 design of rectangular beams reinforced in tension and compression, flanged beams and slabs

Topic No 3 Design for shear and bond and torsion, Permissible shear strength, maximum shear strength

Topic No 4 shear reinforcement and design procedure for shear reinforcement

Topic No 5 bond and development length, anchoring and curtailment of bars.

**UNIT II**

Topic No 6 Limit State Design Method :Introduction, Limit States, Characteristic values, characteristic strength, characteristic loads, design values for materials and loads, factored loads. Limit State of Collapse(Flexure) Types of failures

Topic No 7 assumptions for analysis and design of singly reinforced, doubly reinforced sections, and flanged sections, design of singly reinforced, doubly reinforced sections, and flanged sections

Topic No 8 Design of rectangular beam section for torsion, development length, continuation of reinforcement (beyond cut off points).

Topic No 9 Limit State of Collapse (Compression) Columns and their classification, reinforcement in columns,assumptions

Topic No 10 short and long (both tied and helical) columns subjected to axial load

Topic No 11 short columns subject to axial, uniaxial and biaxial bending.

**UNIT III**

Topic No 12 Slabs: Introduction to one way and two-way slabs

Topic No 13 Design examples. Advantages of flat slabs

Topic No 14 general design considerations, approximate direct design method

Topic No 15 design of flat slabs, design examples

**UNIT IV**

Topic No 16 Foundations: Isolated footings, Combined footings, rectangular, trapezoidal, strip, strap, raft footings

### Text Books

1. Reinforced Concrete Design, M.L. Gambhir, Macmillan India Limited, New Delhi
2. Limit State Design of Reinforced Concrete, A.K. Jain, Nem Chand Brothers, Roorkee.
3. Limit State Design, Ram Chandra, Standard Book House, New Delhi

### Reference Books

1. Reinforced Concrete Design, Pillai & Menon , Tata McGraw Hill Publishers, New Delhi
2. Reinforced Concrete Structures by Paulay and Thomas Park
3. Reinforced Concrete Design by Nilson and Winter
4. Reinforced Concrete Fundamentals Keith by Ferguson

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**Subject: CONSTRUCTION ENGINEERING AND MANAGEMENT**  
**Subject Code: CE307C**

**L T P Credits**  
**3 -- -- 3**

**Class Work : 25 Marks**  
**Examination : 75 Marks**  
**Total : 100 Marks**  
**Duration of Examination : 3 hours**

**Course Outcomes:**

Students will be able to:

- 1: Do basic planning for a construction project.
- 2: Draw networks and solve using CPM and PERT.
- 3: Perform resource allocation for a project.
- 4: Do project monitoring and control.
- 5: Perform quality assurance and control.

	PO1	PO2	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	3	3	3	3	2	3	3	3	3
CO2	2	2	3	2	1	2	2	2	1	3	2	3	3
CO3	2	1	3	3	3	2	3	3	2	3	3	3	3
CO4	2	2	3	3	2	3	3	3	2	3	3	3	3
CO5	3	3	3	2	3	3	2	3	2	3	3	3	3

**Unit-I**

Topic no 1 Basics of Construction- Unique features of construction, construction projects types and features

Topic no 2 phases of a project, agencies involved and their methods of execution

Topic no 3 Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning,

Topic no 4 Role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content

Topic no 5 concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts

**Unit-II**

Topic no 6 Networks: basic terminology, types of precedence relationships, preparation of CPM networks

Topic no 7 activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks

Topic no 8 PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis

Topic no 9 slack computations, calculation of probability of completion

**Unit-III**

Topic no 10 Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving

Topic no 11 Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving

Topic no 12 Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities

Topic no 13 Planning and organizing construction site and resources- Site: site layout including enabling structures,developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control;

Topic no 14 Equipment: basic concepts of planning and organizing

Topic no 15 Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique,

Topic no 16 resource constraints and conflicts; resource aggregation, allocation

Topic no 17 resource constraints and conflicts; resource aggregation, allocation



#### Unit-IV

- Topic no 18 Project Monitoring & Control-Supervision, record keeping, periodic progress reports, and periodical progress meetings. Updating of plans:
- Topic no 19 purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures. Basics of Modern Project
- Topic no 20 management systems such as Lean Construction; Use of Building Information Modeling (BIM) in project management
- Topic no 21 Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection,
- Topic no 22 basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction organizing for safety and health

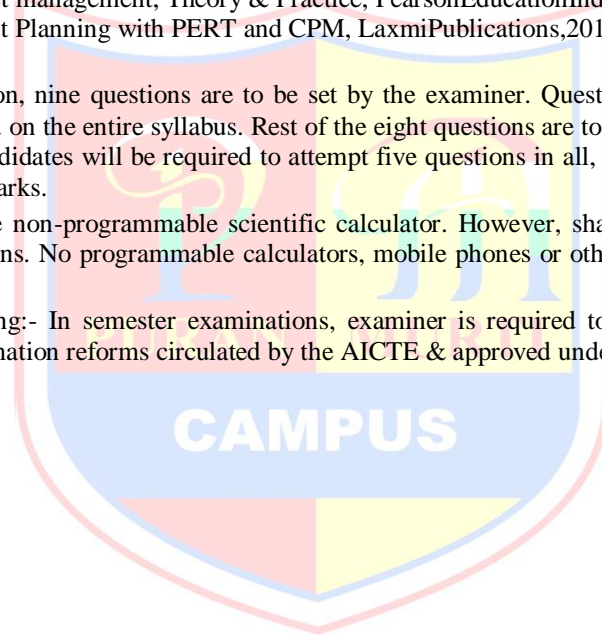
#### Text/Reference Books:

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
7. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

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**Subject: GEO-MECHANICS**

**Subject Code:CE309C**

**L T P Credits**  
**3 1 -- 4**

**Class Work : 25 Marks**  
**Examination : 75Marks**  
**Total : 100 Marks**  
**Duration of Examination : 3 Hours**

Course Outcomes :After completion of this course the students would be able to:

CO1	Decide the location of various Civil Engineering projects from Geological considerations.
CO2	Understand Process of weathering of rocks and formation of soil, Properties of different types of soils, and their classifications.
CO3	Analyse the stresses at different points (subsurface), under different loading conditions and Determine the Compaction and Consolidation behavior of soil.
CO4	Understand permeability of the soil and its determination and Analyse the Shear Strength of the soil.

CO-PO/PSO Articulation Matrix :

	PO1	PO2	PO4	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	3	3	2	2	2	2	2	2	2
CO2	2	3	1	2	1	-	1	1	2	2	-	1
CO3	2	2	2	1	-	-	-	1	1	1	2	1
CO4	2	1	1	1	1	1	1	2	1	2	2	2

**UNIT I**

Topic no 1 Introduction to Engg. Geology: Importance of Engineering Geology, Geological considerations in the Civil Engineering projects

Topic no 2 such as Highways, foundations, dams and reservoirs. Weathering: Agents and effects, Geological works of rivers, wind

Topic no 3 glaciers and oceans as agents of erosion, transportation and deposition, resulting features and engineering importance.

Topic no 4 Basic Soil Properties: Importance of soil mechanics for Civil Engg., Index properties of soils, Phase relationships and their derivations

Topic no 5 Sieve & Hydrometer analysis and Particle Size Distribution Curves, Atterberg's limits, Various soil types, Soil map of India

Topic no 6 sensitivity, thixotropy. Indian standard and Unified classification systems of soils

**UNIT II**

Topic no 7 Permeability of soil: Relevance of permeability in Civil engineering, Darcy's law, Discharge Velocity and Seepage Velocity

Topic no 8 Validity of Darcy's Law, Factors affecting permeability, Laboratory and field determination of permeability

Topic no 9 Average permeability of layered soils

Topic no 10 Seepage Analysis: Types of head, seepage forces, quick sand condition and critical hydraulic gradient. Flow net and its properties, Laplace equation

Topic no 11 methods of drawing flow net. Seepage through earth dams, exit gradient and seepage pressures

Topic no 12 Determination of Phreatic Line of an earth dam with or without filter, Phenomenon of piping.

**UNIT III**

Topic no 13 Compaction: Concept of Compaction, Water Content Density relationship, Zero Air Voids Line, Standard Proctor and Modified Proctor test, OMC

Topic no 14 Placement Water Content, Field Compaction Control, Factors affecting compaction, Field Compaction Methods, Suitability of various compaction equipment

Topic no 15 Consolidation: One dimensional consolidation, Terzaghi's spring analogy of consolidation process, Difference between Primary and Secondary Consolidation

Topic no 16 Pressure Void Ratio relationships for the consolidation of laterally confined soil, Normally Consolidated, Over Consolidated

Topic no 17 Under consolidated soils, determination of pre-Consolidation pressure, Coefficient of Compressibility

Topic no 18 Coefficient of Volume Change, Coefficient of Consolidation and its relationship (derivation also) with coefficient of permeability

#### UNIT IV

Topic no 19 Stresses in Soils: Boussinesq Equations, its assumptions and Pressure distribution diagrams such as stress isobar or Pressure Bulb

Topic no 20 Vertical Pressure distribution on a horizontal plane, Influence Diagram, Vertical pressure distribution on vertical line

Topic no 21 Vertical Pressure under a uniformly loaded circular area

Topic no 22 Vertical Pressure under Strip load, Vertical Pressure due to a Line Load

Topic no 23 Equivalent Point Load Method, Newmark's Influence Chart

Shear Strength: Concept, Mohr's circle of Stress, Mohr Coulomb Failure Theory, Effective Stress principle, Measurement of Shear strength (Direct Shear Test, Triaxial Shear Test, Unconfined Compression Test, Vane Shear Test), Drainage conditions.

Text Books:

1. Basic and Applied Soil mechanics by Gopal Ranjan & A.S.R. Rao, New Age Publisher, New Delhi.
2. Soil Mechanics and Foundations by B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications, New Delhi.
3. A text book on Soil Mechanics and Foundation Engineering by V.N.S. Murthy, U.B.S. Publisher, New Delhi.
4. Geotechnical Engg. by Parshotham Raj, Tata McGraw Hill, New Delhi.

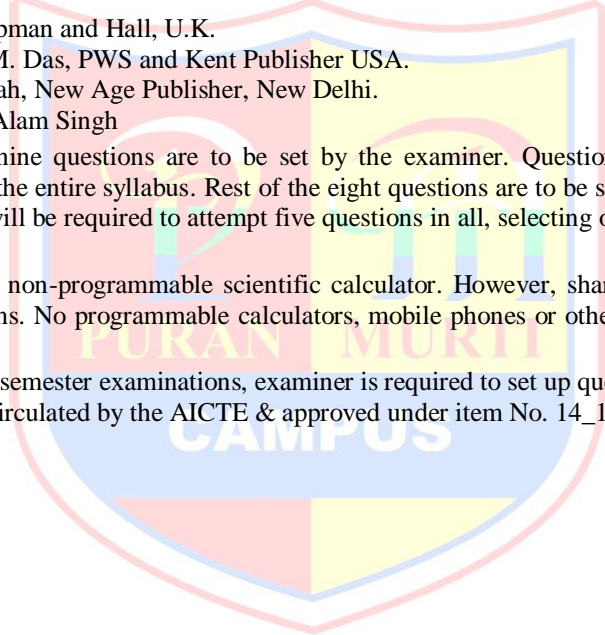
Reference Books:

1. Soil Mechanics by R. F. Craig, Chapman and Hall, U.K.
2. Principles of Soil Mechanics by B.M. Das, PWS and Kent Publisher USA.
3. Geotechnical Engg. by Venkatramaiah, New Age Publisher, New Delhi.
4. Modern Geotechnical Engineering Alam Singh

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**Subject: TRANSPORTATION ENGINEERING**  
**Subject Code: CE311C**

**L T P Credits**  
**3 - - 3**

**Class Work : 25 Marks**  
**Examination : 75 Marks**  
**Total : 100 Marks**  
**Duration of Examination: 3 Hours**

**COURSE OUTCOMES:**

After completion of this course the students will be able to:

1. Design structural and geometric components of permanent way.
2. Design of signaling and interlocking systems.
3. Understand methods of railway tunneling.

CO-PO/PSO Articulation Matrix

	PO1	PO2	PO4	PO6	PO7	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	-	1	1	1	3	-
CO2	2	2	1	2	-	2	1	1	1	3	-
CO3	-	-	1	1	1	-	1	1	1	-	2
CO4	-	-	1	1	-	-	1	1	1	-	2
CO5	3	3	1	2	-	-	1	1	1	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) “-”: no correlation

**UNIT – I**

Topic no 1 Introduction: Role of railways in transportation, historical development of railways. Permanent way and components

Topic no 2 gauges in railway tracks, typical railway track cross-section, coning of wheels, Function of rails, requirement of rails, types of rail sections – comparison of rail types, length of rail, rail wear, rail failures, creep of rails

Topic no 3 rail fixtures and fastenings – Fish plates, spikes, bolts, chairs, keys, bearing plates. Sleepers: Functions and requirements of sleepers, classification of sleepers

Topic no 4 timber, metal and concrete sleeper, comparison of different types of sleepers, spacing of sleepers and sleeper density

Topic no 5 Ballast: Function and requirements of ballast, types, comparison of ballast materials

**UNIT – II**

Topic no 6 Geometric design: Vertical and horizontal alignment, horizontal curves, super elevation, equilibrium

Topic no 7, cant and cant deficiency, length of transition curve, gradients and grade compensation. Stations and yards

Topic no 8 their classification, Points and crossings: introduction, necessity of points

Topic no 9 crossings, turnouts, points and crossings, design of a simple turnout

**UNIT – III**

Topic no 10 Track safety, Signaling and Interlocking: objects of signaling, engineering principle of signaling, classification control of train movements

Topic no 11 absolute, automatic block system, centralized control system, ATS. Interlocking: definition, necessity and function, methods of interlocking

Topic no 12 mechanical devices for interlocking. Traction and tractive resistance, stresses in track, Equipments, Mechanized Maintenance,

Topic no 13 modern methods of track maintenance, rehabilitation and renewal of track; Track Recording & track Tolerances,

Topic no 14 Mass Rapid Transport Systems, High Speed Trains, Present & Future

Topic no 15 modernization of railway tracks, railway systems in modern era.

**UNIT – IV**

Topic no 16 Railway tunneling: Necessity/advantage of a tunnel, Classification of Tunnels, Size and shape of a tunnel, Alignment of a Tunnel, Portals and Shafts

Topic no 17 Mucking, Lighting and Ventilation in tunnel, Dust control, Drainage of tunnels, Safety in tunnel construction

Topic no 18 Methods of Tunneling in Hard Rock and Soft ground

Topic no 19 Cut and cover method, Bored tunnel method, Clay kicking method

Topic no 20 Shaft method, Pipe jacking method, Box jacking method,

Topic no 21 Underwater tunnels

**Text Books**

- 1.Railway Engineering by Arora and Saxena, DhanpatRai& Sons, New Delhi
- 2.Railway Engineering by Rangawala, Charotar Publishing House, Anand
- 3.Railway Engineering by M.M. Aggarwal

Notes:

NOTE: 1.For the semester examination, nine questions are to be set by the examiner. Question no. 9, containing 5-7 short answer type questions, will be compulsory & based on the entire syllabus. Rest of the eight questions are to be set by setting two questions from each of the four units of the syllabus. The candidates will be required to attempt five questions in all, selecting one from each unit AND Question no. 9. All questions will carry equal marks.

2.The students will be allowed to use non-programmable scientific calculator. However, sharing / ex-change of calculator or any other items are prohibited in the examinations. No programmable calculators, mobile phones or other electrical/ electronic items are allowed in the examination.

NOTE: For examiner for paper setting:- In semester examinations, examiner is required to set up question paper covering the entire syllabus in accordance with the examination reforms circulated by the AICTE & approved under item No. 14\_18 of academic council.



**Subject: REINFORCED CONCRETE DESIGN-I LAB**  
**Subject Code: CE313C**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
-	-	2	1

<b>Class Work</b>	<b>: 25 Marks</b>
<b>Examination</b>	<b>: 75Marks</b>
<b>Total</b>	<b>: 100 Marks</b>
<b>Duration of Examination</b>	<b>: 3Hours</b>

**Course Outcomes :**

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

CO1	Use the software tool Auto Cad.
CO2	Understand the structural drawings of various building components.
CO3	Understand the codal provisions of Indian Standards for detailing.
CO4	Test various types of aggregates and cement

**Prepare CO-PO/PSO Articulation Matrix, e.g.:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	2	3	1	1	1	2	2	3	2
CO2	2	2	2	1	3	1	2	1	1	2	3	2
CO3	2	2	2	2	3	1	1	2	2	2	3	2

**A. Structural Drawings through AUTOCAD of the followings**

1. Reinforced concrete beams
2. Simply supported and cantilever slabs
3. Flat slabs
4. Columns.
5. Footings.

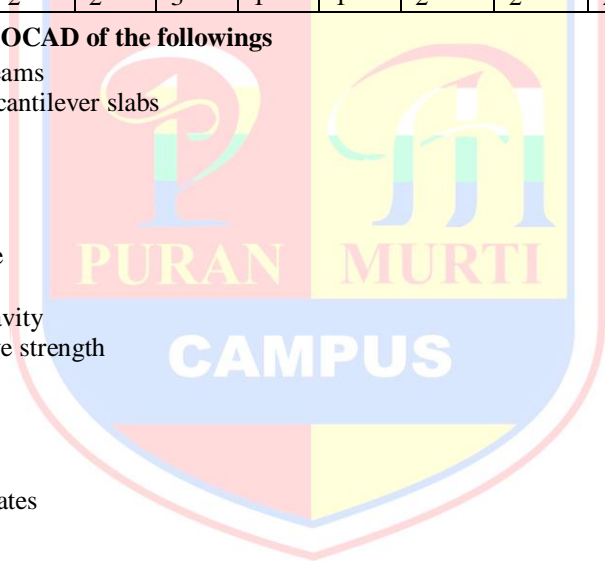
**B. Testing of cement:**

1. Setting time
2. Fineness
3. Specific gravity
4. Compressive strength

**C. Testing of aggregates:**

1. Specific gravity
2. Water absorption
3. Fineness modulus
4. Bulking of fine aggregates

**D. Testing of Concrete for Strength**



Students are required to draw full length sheets on AUTOCAD and perform minimum 10 experiments during semester.

**Subject: GEO-MECHANICS LAB**  
**Subject Code:CE315C**

**L T P Credits**  
**2 1**

**Class Work : 25 Marks**  
**Examination : 75 Marks**  
**Total : 100 Marks**  
**Duration of Examination : 3 Hours**

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

CO1	Understand variation of Geological features and variation of soil in India, from maps.
CO2	Have clear understanding of Folds and Faults and various other geological features.
CO3	Analyze and Determine various properties of soils and their classification.
CO4	Work with various laboratory equipment and test procedures.

**CO-PO/PSO Articulation Matrix :**

	PO1	PO2	PO4	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	2	2	2	2	2	2	1
CO2	2	3	2	2	2	-	2	1	2	2	2	1
CO3	2	2	1	1	2	-	1	1	1	2	1	1
CO4	2	1	2	2	1	1	2	2	2	2	1	1

**List of Experiments:**

1. Study of Geological features, from the maps.
2. Study of Folds, from the models.
3. Study of Faults, from the models.
4. Study of Soil map of India.
5. Determination of water content of soil, by Oven Drying method.
6. Determination of water content of soil, by Pycnometer.
7. Determination of field density and dry unit weight by Core cutter method.
8. Determination of Specific Gravity of soil, by Pycnometer.
9. Determination of field density by Sand replacement method.
10. Grain size Analysis by Mechanical Method.
11. Grain size Analysis by Hydrometer Method.
12. Determination of Liquid Limit.
13. Determination of Plastic Limit.
14. Classification of a given soil sample based on the above determined properties.

**References Books:**

1. Soil Mechanics and Foundations by B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications, New Delhi.

**Note:** Ten experiments are to be performed in the Semester taking atleast seven experiments from the above list. Remaining three experiments should be performed as designed & set by the concerned Institution as per the scope of the syllabus.

**Subject Code Survey Camp**

**Subject Code: CE317C**

**L T P Credits**  
 -- -- 2 1

**Class Work : 25 Marks**  
**Examination : 75 Marks**  
**Total : 100 Marks**  
**Duration of Examination : 3 Hours**

**Course Outcomes:** This training of survey camp will provide a student

- ii. Knowledge of different components of surveying such as triangulation, topography, mapping
- iii. Utilization of equipment used in surveying

	PO1	PO2	PO3	PO4	PO5	PO9	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	1	3	2
CO2	-	1	-	-	3	3	1	3	1

**Survey Camp:** Civil Engineering Surveying Practical Experience is a Two-Three week course between the spring and summer semesters. Each day is about eight hours long and full of hands-on experience with surveying and map preparation. Teams of 4-6 students will work with faculty, practicing surveyors and use their equipment out in the field. The camp will provide a necessary foundation for any engineer. It will teach them how surveying is applied to engineering projects and what they need to know in order to review survey data. The students will prepare map of an area following various steps like establishment of control points, Triangulation, computations, error adjustment, plotting details on map and contouring .

The students for this course shall be evaluated in 5<sup>th</sup> semester by a Committee consisting of three teachers to be constituted by the Chairperson of the Department.

Teachers associated with evaluation work will be assigned 2 periods per week load.

