



MOTHERHOOD UNIVERSITY

Roorkee-Dehradun Road, Village Karoundi Post Bhagwanpur, Tehsil-Roorkee, Uttarakhand, India

Sr. No.	Subject Code	Subject Name	Effective Teaching			Credits	Evaluation Scheme		
			L	T	P		Internal Assessment	External Assessment	Total Marks
			Hours/week						
THEORY									
1	MUPCE501N	Reinforced Concrete Design	5	-	-	3	25	100	125
2	MUPCE502N	Highway & Airport Engineering	3	-	-	4	25	80	105
3	MUPCE503N	Railways, Bridges and Tunnel Engineering	3	-	-	4	25	80	105
4	MUPCE504N	Estimating & Costing	5	-	-	4	25	80	105
5	MUPCE505N	Geotechnical Engineering	4	-	-	4	25	80	105
PRACTICAL/PROJECT									
6	MUPCE 552N	Highway & Airport Engineering	-	-	4	3	25	75	100
7	MUPCE 555N	Geotechnical Engineering	-	-	4	3	25	75	100
8	MUPCE 556N	Computer Application In Civil Engineering	-	-	4	2	25	75	100
9	MUPCE 557N	Industrial Training			2	1	25	80	25
10	MUPGP 551N	General Proficiency	-	-	1	1	25	-	25
11	MUPGP 552N	Industrial Exposure (Assessment at University Level)	-	-	1	1	25	-	105
		TOTAL	24	-	12	30	275	725	1000
NOTE: - Industrial Training of 30 days done after 4th semester would be evaluated in 5th Semester through Report and Viva Voice.									



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Roorkee-Dehradun Road, Village Karoundi Post Bhagwanpur, Tehsil-Roorkee, Utrakhand, India

FIFTH SEMESTER CIVIL ENGINEERING



MUPCE-501N	Reinforced Concrete Design	5L:0T:0P	3 Credits
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Course Objectives

1. The objectives of the course is:
2. To explain properties of cement, aggregate, concrete, admixtures
3. To explain the basic design philosophy behind the Working Stress method
4. To explain the basic design philosophy behind the Limit state method.
5. To design basic structural elements like slabs, beams, columns, staircases & isolated footings.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To Understand Properties of mild steel and HYSD steel.	K2



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Roorkee-Dehradun Road, Village Karoundi Post Bhagwanpur, Tehsil-Roorkee, Utrakhand, India

CO2	To Understand Introduction to limit state, working state method, and shear reinforcement.	K2
CO3	To Understand basic assumptions of limit state method, and different design loads.	K2
CO4	To Understand singly and doubly reinforced beams.	K2
CO5	To Understand knowledge of slabs columns and basics of prestress concrete.	K2

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create



REINFORCED CONCRETE DESIGN

SubjectCode: MUPCE-501N

L	T	P
5	-	-

RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RC Construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters). This subject thus deals with elementary design principles as per IS: 456-2000

DETAILED CONTENTS

1. Introduction

Concept of Reinforced Cement Concrete (RCC)

Reinforcement Materials:

- Suitability of steel as reinforcing material
- Properties of mild steel and HYSD steel

Loading on structures as per IS:875

2. Introduction to following methods of RCC design

Working stress method

Limit state method

3. Shear and Development Length

Shear as per IS: 456-2000 by working stress method

Shear strength of concrete without shear reinforcement

Maximum shear stress

Shear reinforcement

4. Singly Reinforced Beam (Working stress method)

Basic assumptions and stress strain curve, neutral axis, balanced, under-reinforcement and over-reinforced beams, Moment of resistance for singly reinforced beam.

Design of singly reinforced beam including sketches showing reinforcement details.

5. Concept of Limit State Method



Definitions and assumptions made in limit state of collapse (flexure)

Partial factor of safety or materials.

Partial factor of safety for loads

Design loads

Stress block parameters

6. Singly Reinforced beam

Theory and design of singly reinforced beam by Limit State Method.

Check for shear, Check for deflection, check for development length

7. Doubly Reinforced Beams

Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method

8. Study of Beams

Behaviour of T beam, inverted T beam, isolated T beam and „L“ beams (No Numericals)

9. One Way Slab

Theory and design of simply supported one way slab including sketch showing reinforcement details (plan and section) by Limit State Method.

Check for shear, Check for deflection,

10. Two Way Slab

Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketch showing reinforcement details (plan and two sections)

11. Axially Loaded Column

Definition and classification of columns

Effective length of column,

Specifications for longitudinal and lateral reinforcement

Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement (sectional elevation and plan)

12. Prestressed Concrete

Concept of pre-stressed concrete



Methods of pre-stressing: pre-tensioning and post-tensioning

Advantages and disadvantages of pre-stressing

Losses in pre-stress Important

Note: Use of IS:456-2000 is permitted in the examination.

INSTRUCTIONAL STRATEGY

Teachers are expected to give simple problems for designing various RCC structural members. For creating comprehension of the subject, teachers may prepare tutorial sheets, which may be given to the students for solving. It would be an advantage of students if taken at construction site to show form work for RCC as well as placement of reinforcement in various structural members. Commentary on BIS: 456 may be referred along with code for relevant clauses.

RECOMMENDED BOOKS

1. Punmia, B.C.; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi
2. Ramamurtham, S.; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi
3. Gambhir, M.L., "Reinforced Concrete Design", Macmillan India Limited
4. Singh, Birinder "RCC Design and Drawing", Kaption Publishing House, New Delhi
5. Singh Harbhajan "Design of Reinforced Concrete Structures" Abhishek Publishers Ltd., Chandigarh
6. Mallick, S.K.; and Gupta, A.P.; "Reinforced Concrete", Oxford and IBH Publishing Co., New Delhi.
7. Singh Harbhajan "Limit State RCC Design" Abhishek Publishers Ltd., Chandigarh



MUPCE-502N	Highway & Airport Engineering	3L:0T:0P	4 Credits
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Course Objectives

The objectives of the course is:

1. To impart the knowledge in Highway Geometrics
2. construction methods and design of different type of pavements
3. design of base course and sub-base course
4. Understand the various type of materials used in highway construction

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To Understand importance of highway engineering and road geometries	K2
CO2	To Understand knowledge of road materials and road pavements	K2
CO3	To Understand basics of hill road construction and its drainage system	K2
CO4	To Understand knowledge of road construction equipments for road maintenance.	K2
CO5	To Understand introduction to airport engineering.	K2

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create



HIGHWAY&AIRPORT ENGINEERING

Subject Code:MUPCE-502N

L	T	P
3	-	4

RATIONALE

Construction of roads is one of the areas in which diploma holders in Civil Engineering may get employment. These diploma holders are responsible for construction and maintenance of highways and airports. Basic concepts of roadgeo-metrics ,surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course.

DETAILEDCONTENTS

1. Introduction

Importance of Highway engineering

Functions of IRC,CRRI,MORT&H,NHAI

IRC classification of roads

PMGSY and MNERGA Roads

2. Road Geometrics

Glossary of terms used in road geo-metrics and their importance: Right of way, formation width, road margin , road shoulder, carriage way, side slopes, curves, formation levels, camber and gradient

Average running speed, stopping and passing sight distance

Necessity of curves, horizontal and vertical curves including transition curves. Super elevation and methods of providing super elevation

Sketch of typical cross-sections in cutting and filling on straight alignment and curve

(Note: No design/numerical problem to be taken)

3. Highway Surveys and Plan

Topographic map, reading the data given on a topographic map



Basic considerations governing alignment for a road in plain and hilly area

Highway location ;marking of alignment

4. Road Materials

Different types of road materials in use; soil, aggregate, binders – bitumen, cutback, Emulsion and Modified Bitumen (CRMB, PMB)

Binders: Common binders; bitumen, properties as per BIS specifications, penetration, softening point, ductility and viscosity tests of bitumen, procedures and significance, cutback and emulsion and their uses, Bitumen modifiers

5. Road Pavements

Road pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components

5.2. Introduction to California Bearing Ratio, method of finding CBR value and its significance. Aggregate: Source and types, important properties, strength, durability

Sub-grade preparation: Setting out alignment of road, setting out benchmarks, control pegs for embankment and cutting, borrow pits, making profiles of embankment, construction of embankment, compaction, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation. Stabilization of subgrade. Types of stabilization mechanical stabilization, lime stabilization, cement stabilization, fly ash stabilization etc. (introduction only)

Introduction to Sub Base Course and Base Course:

a) Granular base course:

(i) Water Bound Macadam (WBM)

(ii) Wet Mix Macadam (WMM)

b) Bitumen Courses:

(i) Bituminous Macadam

(ii) Dense Bituminous Macadam

(DBM) c) *Methods of construction as per MOR

T&H

Surfacing:

a) *Types of surfacing

i) Prime coat and tack coat

ii) Surface dressing with seal coat

iii) Open graded premix carpet



- iv) Mix seal surfacing
- v) Semi dense bituminous concrete
- vi) Bituminous Concrete/Asphaltic concrete

vii) Mastic Asphalt

b)* Methods of constructions as per MORT&H specifications and quality control..

Rigid Pavements:

Construction of concrete roads as per IRC specifications: Formwork laying, mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipment used.

6. Hill Roads:

Introduction: Typical cross-sections showing all details of a typical hill road, partly in cutting and partly in filling

Special problems of hill areas

Landslides: Causes, prevention and control measures, use of geogrids, geo flexiles, geo-synthetics

Drainage

Soil erosion

Snow: Snow clearance, snow avalanches, frost

Land Subsidence

7. Road Drainage

Necessity of road drainage work, cross drainage works

Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage. Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections

8. Road Maintenance

Common types of road failures of flexible pavements: Pothole, rutting, alligator cracking, upheaval-their causes and remedies (brief description)

Maintenance of bituminous roads such as seal-coat, patch-work and recarpeting.

Maintenance of concrete roads-

filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices



9. RoadConstructionEquipment

Outputanduseofthefollowingplantandequipment

Hotmixplant

Tipper,tractors(wheelandcrawler)scraper,bulldozer,dumpers,shovels,grader,roller,dragline

Asphalt mixer and tarboilers

Road pavers

10 AirportEngineering

Necessityofstudyofairportengineering,aviationtransportscenarioinIndia.

FactorstobeconsideredwhileselectingasiteforanairportwithrespecttozoningLaws,ImportanceofWindrosediagraminairportdesign.

IntroductiontoRunways,TaxiwaysandApron.

- * An expert may be invited from field/industry for extension lecture onthistopic.

PRACTICALEXERCISES

1. Determinationofpenetrationvalueofbitumen
2. Determinationofsofteningpointofbitumen
3. Determinationofductilityofbitumen
4. Determinationofimpactvalueoftheroadaggregate
5. Determinationofabrasionvalue(LosAngeles”)ofroadaggregate
6. DeterminationoftheCaliforniabearingratio(CBR)forthesub-gradesoil
7. VisittoHotmixplant
8. Visit to highway construction site for demonstration of operation of: Tipper,tractors(wheelandcrawler),scraper,bulldozer,dumpers,shovels,grader,roller,dragline,roadpavers,JCBetc.
9. Mixingandsprayingequipment
10. AcompulsoryvisittoReadyMixConcreteplant.
11. DeterminationofViscosityofTar/Bitumen

RECOMMENDEDBOOKS

- i) Khanna,SKandJusto,CEG,"HighwayEngineering",NemChandandBros.,Roorkee
- ii) Vaswani,NK,"HighwayEngineering",RoorkeePublishingHouse,Roorkee,
- iii) Priyani,VB,"HighwayandAirportEngineering"Anand,CharotarBookStall
- iv) Sehgal,SB;andBhanot,KL;"ATextBookonHighwayEngineeringandAirport"SC



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Roorkee-Dehradun Road, Village Karoundi Post Bhagwanpur, Tehsil-Roorkee, Utrakhand, India

handandCo,Delhi

v) Bindra,SP;"ACourseonHighwayEngineering",DhanpatRaiandSons,NewDelhi



MUPCE-503N	Railway, Bridges & Tunnel Engineering	3L:0T:0P	4 Credits
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Course Objectives

The objectives of the course is:

1. To explain standard terminologies of railway track
2. To describe railway turnout and their detailed component part, also facilities regarding maintenance of railway route
3. To demonstrate airport layout and traffic control strategies.
4. To explain Tunnel Engineering

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To Understand introduction to Indian railways and classification of railway components	K1
CO2	To Understand basics of earthwork and drainage system	K1
CO3	To Understand introduction and classification of bridges	K2
CO4	To Understand knowledge of IRC classification	K2
CO5	To Understand basic definitions and necessity of tunnel engineering	K2

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create



RAILWAYS, BRIDGES AND TUNNEL ENGINEERING

Subject Code: MUPCE 503N

L	T	P
3	-	-

RATIONALE

The subject will cater to the needs of those technicians who would like to find employment in the construction of railway tracks, bridges and tunnels. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges and tunnels

DETAILED CONTENTS

PART-I: RAILWAYS

1. Introduction to Indian Railways
2. Railways surveys: Factors influencing the railway route, brief description of various types of railway survey
3. Classification of permanent way describing its component parts
4. Rail Gauge: Definition, types, practice in India
5. Rails – types of rails
6. Rail Fastenings: Rail joints, types of rail joints, fastenings for rails, fish plates, bearing plates
7. Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers.
8. Ballast: Function of ballast, requirements of an ideal material for ballast
9. Crossings and signalings: Brief description regarding different types of crossings/signalings (Latest electronics operated signal devices)
10. Maintenance of track: Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools
11. Earthwork and drainage: Features of railroad, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system

PART-II: BRIDGES

12. Introduction
Bridge – its function and component parts, difference between a bridge and a culvert
13. Classification of Bridges
Their structural elements and suitability:
According to life – permanent and temporary



According to deck level – Deck, through and semi-through

According to material – timber, masonry, steel, RCC, pre-stressed

According to structural form;

- Grade Separators - Railway Over bridges (ROB), Railway under bridge (RUB)
- Beam type – RCC, T-Beam, steel girder bridges, plate girder and box girder, balanced cantilever, Trussed bridges.
- Arch type – open spandrel and filled spandrel barrel and rib type
- Suspension type – unstiffened and stiffened and table (its description with sketches)
- According to the position of highest flood levels submersible and non-submersible

IRC classification

14. Bridge Foundations: Introduction to open foundation, pile foundation, well foundation

15. Piers, Abutments and Wing walls

Piers – definition, parts; types – solid (masonry and RCC), open

Abutments and wing walls –

definition, types of abutments (straight and tee), abutment with wing walls (straight, splayed, return and curved)

Launching of Equipment Bridges

16. Bridge bearings

Purpose of bearings; types of bearings – fixed plate, rocker and roller.

17. Maintenance of Bridges

Inspection of Steel and Equipment bridges

Routine maintenance

PART-III: TUNNELS

18. Definition and necessity of tunnels

19. Typical section of tunnels for a national highway and single and double broad gauge railway track

20. Ventilation –

necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust

21. Drainage method of draining water in tunnels



22. Lighting of tunnels

Notes: i) Field visits may be organized to Bridge construction site or a Bridge/Tunnel construction site/Railway track to explain the various components and a field visit report shall be prepared by the students, as a team work



- ii) Examiners should set questions from all the parts

INSTRUCTIONAL STRATEGY

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various components and construction of railway track, bridges and tunnel.

RECOMMENDED BOOKS

1. Vaswani, NK, "Railway Engineering", Publishing House, Roorkee
2. Rangwala, SC, "Railway Engineering", Anand, Charotar Book Stall
3. Deshpande, R, "A Text Book of Railway Engineering", Poonam United Book Corporation
4. Algia, JS "Bridge Engineering", Anand, Charotar Book Stall
5. Victor Johnson, "Essentials of Bridge Engineering" Oxford and IBH, Delhi
6. Rangwala S.C., "Bridge Engineering", Anand, Charotar Book Stall
7. IRC Bridge Codes
8. MORTH drawings for various types of bridges
9. MORTH pocket books for bridge Engineers, 2000 (First Revision)
10. Subhash C Saxena, "Tunnel Engineering", Dhanpat Rai and Sons, Delhi



MUPCE-504N	Estimating & Costing	5L:0T:P	4 Credits
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Course Objectives

The objectives of the course is:

1. Will have a basic knowledge on methods and types of estimation and its merits and demerits
2. Have knowledge on specifications and tendering process for contracts
3. Purpose Methods of estimation
4. Will able to value a property, price escalation recommendations and auditing

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To Understand Types of estimates and rules of measurement	K1
CO2	To Understand Calculations and preparation of detailed estimates	K2
CO3	To Understand Analysis of rates and contractor ship	K2
CO4	To Understand Preparation of tender document on common schedule rate	K2
CO5	To Understand Purpose and principle of valuation	K2

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create



ESTIMATING & COSTING

Subject Code: MUPCE 504N

L	T	P
5	-	-

RATIONALE

Diplomaholders in Civil Engineering are supposed to prepare material estimates for various Civil Engineering works namely; buildings, irrigation works, public health works and road setc. In addition, they must have a basic knowledge regarding analysis of rates, contracting, principles of valuation. Therefore, this subject has great importance for diplomaholders in Civil Engineering.

DETAILED CONTENTS

1. Introduction to quantity surveying and its importance. Duties of quantity surveyor

2. Types of estimates

Preliminary estimates

- Plinth area estimate
- Cubic rate estimate
- Estimate per unit base

Detailed estimates

- Definition
- Stages of preparation – detail of measurement and calculation of quantities and abstract

3. Measurement

Unit of measurement for various items of work as per BIS: 1200

Rules for measurements

- Different methods of taking out quantities – centre line method and long wall and short wall method

4. Preparation of Detailed and Abstract Estimates from Drawings for:

A small residential building with a flat roof and pitched roof building comprising of One/Two rooms with W.C., bath, kitchen and verandah

Earthwork for unlined channel

WBM road and pre-mix carpeting



SinglespanRCCslabculvert

Earthworkforplainandhillroads

RCCworkinbeams,slab,columnandintel,foundations

usersseptictank-25users

5. Calculationofquantitiesofmaterialsfor

Cementmortarsofdifferentproportion

Cementconcreteofdifferentproportion

Brick/stonemasonryincementmortar

Plasteringandpointing

Whitewashing,painting

R.C.C.workinslab,beams

6. AnalysisofRates

Stepsinvolvedintheanalysisofrates.Requirementofmaterial,labour,sundries,contractor'sprofitandoverheads

Analysisofratesforfinisheditemshendataregardinglabour,ratesofmaterialandlabourisgiven:

- Earthworkinexcavationinhard/ordinarysoilandfillingwithaconceptofleadandlift
- RCCinroofslab/beam/lintels/columns
- Brickmasonryincementmortar
- CementPlaster
- Whitewashing,painting
- Stonemasonryincementmortar

7 Contractorship

- Meaningofcontract
- Qualitiesofagoodcontractorandtheirqualifications
- Essentialsofacontract
- Typesofcontracts,theiradvantages,dis-advantagesandsuitability,systemof payment
- Singleandtwocover-bids; tender, tender forms and documents, tendernotice,submissionoftenderanddepositofearnestmoney,securitydeposit,retentionmoney,maintenanceperiod



- Classification and types of contracting firms/construction companies

- 8 Preparation of Tender Document based on Common Schedule Rates (CSR/SOR)
 - Introduction to CSR and calculation of cost based on premium on CSR/SOR
 - Exercises on writing detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation
 - Exercises on preparing tender documents for the following
 - a) Earthwork
 - b) Construction of a small house as per given drawing
 - c) RCC works
 - d) Pointing, plastering and flooring
 - e) White-washing, distemping and painting
 - f) Woodwork including polishing
 - g) Sanitary and water supply installations
 - h) False ceiling, aluminum (glazed) partitioning
 - i) Tile flooring including base course
 - j) Construction of W.B.M/Concrete road

- 9. Exercises on preparation of comparative statements for item rate contract
- 10. Valuation
 - a) Purpose of valuation, principles of valuation
 - b) Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc.
 - c) Methods of valuation (i) replacement cost method (ii) rental return method

RECOMMENDED BOOKS

1. Pasrija, HD, Arora, CL and S. Inderjit Singh, "Estimating, Costing and Valuation (Civil)", New Asian Publishers, Delhi,
2. Rangwala, S. C, "Estimating and Costing", Anand, Charotar Book Stall
3. Chakraborti, M, "Estimating, Costing and Specification in Civil Engineering", Calcutta
4. Dutta, BN, "Estimating and Costing
5. Mahajan Sanjay, "Estimating and Costing" Satya Parkashan, Delhi



MUPCE-505N	Geotechnical Engineering	4L:0T:4P	4 Credits
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Course Objectives

The objectives of the course is:

1. To present the foundations of many basic Engineering tools and concept related Geotechnical Engineering.
2. analyze the effect of flow of fluids through soils
3. evaluate the compressibility of soils
4. understand various bearing capacity determination techniques

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand importance constituents and classification of soils	K1
CO2	To understand flow of water through soil and concept of stress	K2
CO3	To understand deformation and shear strength characteristics of soil	K2
CO4	To understand bearing capacity and exploration of soil	K2
CO5	To understand Concept of shallow and deep foundation	K2

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create



GEOTECHNICAL ENGINEERING

Subject Code: MUPCE 505N

L	T	P
4	-	4

RATIONALE

Civil Engineering diploma engineers are required to supervise the construction of structural buildings, roads, pavements, dams, embankments, and other Civil Engineering structures. As such the knowledge of basic soil engineering is the prerequisite for these engineers for effective discharge of their duties. This necessitates the introduction of Soil and Foundation Engineering subject in the curriculum for Diploma Course in Civil Engineering.

The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of soils, their selection and proper use in the field for various types of engineering structures.

The emphasis will be more on teaching practical aspects rather than theory.

DETAILED CONTENT THEORY

1. Introduction

Importance of soil studies in Civil Engineering

Geological origin of soils with special reference to soil profiles in India: residual and transported soil, alluvial deposits, lake deposits, local soil found in J&K, dunes and loess, glacial deposits, black cotton soils, condition in which above deposits are formed and their engineering characteristics.

Names of organizations dealing with soil engineering work in India, soil map of India

2. Physical Properties of Soils

Constituents of soil and representation by a phased diagram

Definitions of void ratio, porosity, water content, degree of saturation, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight of soil grains and correlation between them

Simple numerical problems with the help of phased diagrams

3. Classification and Identification of Soils

Particle size, shape and their effect on engineering properties of soil, particle size classification of soils



Gradation and its influence on engineering properties

Relative density and its use in describing cohesionless soils

Behaviour of cohesive soils with change in water content, Atterberg's limit-definitions, use and practical significance

Field identification tests for soils

Soil classification system as per BIS 1498; basis, symbols, major divisions and subdivisions, groups, plasticity chart; procedure for classification of a given soil.

4. Flow of Water Through Soils

Concept of permeability and its importance

Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability

Comparison of permeability of different soils as per BIS

Measurement of permeability in the laboratory

5. Effective Stress: (Concept only)

Stresses in subsoil

Definition and meaning of total stress, effective stress and neutral stress

Principle of effective stress

Importance of effective stress in engineering problems

6. Deformation of Soils

Meaning, conditions/situations of occurrence with emphasis on practical significance of:

a) Consolidation and settlement

b) Creep

c) Plastic flow

d) Heaving

e) Lateral movement

f) Freeze and thaw of soil

Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.

Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects

Settlement due to construction operations and lowering of water table

Tolerable settlement for different structures as per BIS



7. Shear Strength Characteristics of Soils

Concept and Significance of shear strength

Factors contributing to shear strength of cohesive and cohesionless soils, Coulomb's law

Examples of shear failure in soils

8. Compaction

Definition and necessity of compaction

Laboratory compaction test (standard and modified proctor test as per BIS) definition and importance of optimum water content, maximum dry density;

moisture-dry density relationship for typical soils with different compactive efforts

8.3. Compaction control; Density control, measurement of field density by core cutter method and sand replacement method, moisture control, Proctor's needle and its use, thickness control, job of an embankment supervisor in relation to compaction

9. Soil Exploration

Purpose and necessity of soil exploration

Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly dealt)

Sampling; undisturbed, disturbed and representative samples; selection of type of sample; thin wall and piston samples; area ratio, recovery ratio of samples and their significance, number and quantity of samples, resetting, sealing and preservation of samples.

Presentation of soil investigation results

10 Bearing Capacity of soil

Concept of bearing capacity

Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure

Guidelines of BIS (IS 6403) for estimation of bearing capacity of soil

Factors affecting bearing capacity

Concept of vertical stress distribution in soils due to foundation loads, pressure bulb

Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity

Plate load test (no procedure details) and its limitations



Improvement of bearing capacity by sand drain method, compaction, use of geosynthetics.

11. Foundation Engineering

Concept of shallow and deep foundation; types of shallow foundations: isolated, combined, strip, mat, and their suitability. Factors affecting the depth of shallow foundations, deep foundations, types of well foundation and their suitability, type of piles and their suitability; pile classification on the basis of material, pile group and pile cap.

PRACTICAL EXERCISES

- a) To determine the moisture content of a given sample of soil
- b) Auger Boring and Standard Penetration Test
 - a. Identifying the equipment and accessories
 - b. Conducting boring and SPT at a given location
 - c. Collecting soil samples and their identification
 - d. Preparation of boring log and SPT graphs
 - e. Interpretation of test results
- c) Extraction of Disturbed and Undisturbed Samples Extracting a block sample
 - a. Extracting a tube sample
 - b. Extracting disturbed samples for mechanical analysis.
 - c. Field identification of samples
- d) Field Density Measurement (Sand Replacement and Core Cutter Method)
 - a. Calibration of sand
 - b. Conducting field density test at a given location
 - c. Determination of water content
 - d. Computation and interpretation of results
- e) Liquid Limit and Plastic Limit Determination:
 - a. Identifying various grooving tools
 - b. Preparation of sample
 - c. Conducting the test
 - d. Observing soil behaviour during tests
 - e. Computation, plotting and interpretation of results
- f) Mechanical Analysis
 - a. Preparation of sample
 - b. Conducting sieve analysis



- c. Computation of results

- g) Laboratory Compaction Tests (Standard Proctor Test)
 - a. Preparation of sample
 - b. Conducting the test
 - c. Observing soil behaviour during test
 - d. Computation of results and plotting
 - e. Determination of optimum moisture content and maximum dry density

- h) Demonstration of Unconfined Compression Test
 - a. Specimen preparation
 - b. Conducting the test
 - c. Plotting the graph
 - d. Interpretation of results and finding/bearing capacity
- i) Demonstration of:
 - a. Direct Shear and Vane Shear Test on sandy soil samples
 - b. Permeability test apparatus

RECOMMENDED BOOKS

1. Punmia, BC, "Soil Mechanics and Foundations"; Standard Publishers, Delhi
2. Bharat Singh and Shamsher Prakash; "Soil Mechanics and Foundations Engineering", Nem Chand and Bros, Roorkee,
3. Sehgal, SB, "A Text Book of Soil Mechanics"; CBS Publishers and Distributors, Delhi
4. Gulati, SK and Manoj Dutta, "Geotechnical Engineering", Tata McGraw Hill, Delhi,
5. Ranjan Gopal and Rao ASR "Basic and Applied Soil Mechanics", New Age Publication (P) Ltd., New Delhi
6. Singh Harbhajan "Soil and Foundation Engineering", Abhishek Publishers, Chandigarh
7. S Mittal and JP Shukla, "Soil Testing for Engineers", Khanna Publishers Ltd., Delhi
8. BIS Codes IS 6403 (latest edition) and IS 1498 (latest edition)
9. Jagroop Singh, "Soil and Foundation Engineering", Eagle Parkashan, Jalandhar
10. Rabinder Singh, "Soil and Foundation Engg." SK Kataria and Sons, Ludhiana
11. NITTTR, Chandigarh, "Shallow Foundations"
12. Video films on Geo-technical Laboratory Practices by NITTTR, Chandigarh



COMPUTER APPLICATION IN CIVIL ENGINEERING

Subject Code: MUPCE 506N

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RATIONALE

Computer applications play a very vital role in present day life and more so, in the professional life of diploma engineer. In order to enable the students use the computer effectively in problem solving, this course offers applications of various computer softwares in civil engineering.

DETAILED

CONTENTS PRACTICAL EXERCISES

1. Introduction and use of AutoCAD for making 2D Drawings and develop plan, section and elevation of 2 rooms building.
2. Demonstration of various civil engineering softwares like STAAD-Pro, MS Projector Primavera Project Planner, Auto Civil, MX Road or any other equivalent software for above mentioned software.

Note:

- i) The polytechnics may use any other software available with them for performing the exercises
- ii) If the above softwares are not available in the institution, the demonstration of the above said softwares should be arranged outside the institute.