

5.1 STEEL STRUCTURES DESIGN

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RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design principles as per BIS code of practice IS: 800 - 2007

DETAILED CONTENTS THEORY

1. Structural Steel and Sections: (02 hrs)

- 1.1 Properties of structural steel as per IS Code
- 1.2 Designation of structural steel sections as per IS handbook and IS:800 - 2007

2. Riveted Connections: (10 hrs)

Types of rivets, permissible stresses in rivets, types of riveted joints, specifications for riveted joints as per IS 800. Failure of a riveted joint. Assumptions in the theory of riveted joints. Strength and efficiency of a riveted joint. Design of riveted joints for axially loaded members (No Staggered riveting).

3. Bolted and Welded connections: (06 hrs)

- 3.1 Types of bolts and bolted joints, specifications for bolted joints as per IS: 800 - 2007
- 3.2 Types of welds and welded joints, advantages and disadvantages of welded joints and bolted joints design of fillet and butt weld. Plug and slot welds (Descriptive No numerical on plug and slot welds)

4. Tension Members (16 hrs)

Analysis and design of single and double angle section tension members and their rivetted and welded connections with gusset plate as per IS:800

5. Compression Members (16 hrs)

Analysis and design of single and double angle sections compression members (struts) and their welded connections with gusset plate as per IS:800

6. Roof Trusses (06hrs)
- Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept)
7. Columns: (10 hrs)
- 7.1 Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800 for different end conditions. Analysis and Design of axially loaded single section steel column
- 7.2 Types of column bases (Descriptive only)
- 7.3 Beam and column, frame and seated connections (descriptive only, no design)
8. Beams (10 hrs)
- Analysis and design of single section simply supported laterally restrained steel beams. Introduction to plate girder and functions of various elements of a plate girder
- 9 Fabrication and Erection of Steel Structures like trusses, columns and girders (02 hrs)
- 10 Masonry structures – Design of brick column and wall foundations (02 hrs)

Important Note:

Use of IS: 800 – 2007 and Steel Tables are permitted in examination.

INSTRUCTIONAL STRATEGY

Teachers are expected to give simple problems for designing various steel 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 advantageous if students are taken at construction site to show fabrication and erection of steel structures. IS:800 may be referred along with code for relevant clauses

RECOMMENDED BOOKS

1. Duggal SK, "Design of Steel Structures" by Standard Publishers, Delhi
2. Birinder Singh, "Steel Structures Design and Drawing", Kaption Publishing House, Ludhiana
3. Ram Chandra, "Design of Steel Structures", Standard Publishers, Delhi
4. LS Negi, "Design of Steel Structure" Tata McGraw Hill, New Delhi
5. S Ramamurthan, "Design of Steel Structures",
6. Harbhajan Singh, "Design of Steel Structures", Abhishek Publishing, Chandigarh
7. IS Code : 800-2007

8. Design of Steel Structures by N. Subramanian; Oxford University Press.
9. Design of Steel Structures by Limit State Method by S S Bharikatti; I K International Publishing House Pvt.
10. Design of Steel Structures by K S Sai Ram, Pearson Education
11. Limit State Design of Steel Structures by Karuna Roy Ghosh, PHI, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	03
2	10	12
3	06	08
4	16	19
5	16	19
6	06	08
7	10	12
8	10	13
9	02	03
10	02	03
Total	80	100

5.2 HIGHWAY ENGINEERING

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RATIONALE

Construction of roads is one of the area 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 road geo-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.

DETAILED CONTENTS

1. Introduction (02 hrs)
 - 1.1 Importance of Highway engineering
 - 1.2 Functions of IRC, CRRI, MORT&H, NHAI
 - 1.3 IRC classification of roads

2. Road Geometrics (10 hrs)
 - 2.1 Glossary of terms used in road geo-metrics and their importance: Right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient
 - 2.2 Average running speed, stopping and passing sight distance
 - 2.3 Necessity of curves, horizontal and vertical curves including transition curves. Super elevation and methods of providing super elevation
 - 2.4 Sketch of typical cross-sections in cutting and filling on straight alignment and at a curve
(Note: No design/numerical problem to be taken)

3. Highway Surveys and Plan (10 hrs)
 - 3.1 Topographic map, reading the data given on a topographic map
 - 3.2 Basic considerations governing alignment for a road in plain and hilly area
 - 3.3 Highway location; marking of alignment

4. Road Materials (10 hrs)
- 4.1 Different types of road materials in use; soil, aggregate, binders – bitumen, cutback, Emulsion and Modified Bitumen (CRMB, PMB)
- 4.2 Binders: Common binders; bitumen, properties as per BIS specifications, penetration, softening point, ductility and viscosity test of bitumen, procedures and significance, cut back and emulsion and their uses, Bitumen modifiers
5. Road Pavements (12 hrs)
- 5.1 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
- 5.3 Sub-grade preparation:
Setting out alignment of road, setting out bench marks, 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)
- 5.4 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 MORT&H
- 5.5 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..

5.6 Rigid Pavements:

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

6. Hill Roads: (06 hrs)

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

6.2 Special problems of hill areas

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

6.2.2 Drainage

6.2.3 Soil erosion

6.2.4 Snow: Snow clearance, snow avalanches, frost

6.2.5 Land Subsidence

7. Road Drainage: (06 hrs)

7.1 Necessity of road drainage work, cross drainage works

7.2 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: (06 hrs)

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

8.2 Maintenance of bituminous road such as seal-coat, patch-work and recarpetng.

8.3 Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices

9. Road Construction Equipment: (08 hrs)

Output and use of the following plant and equipment

- 9.1 Hot mix plant
- 9.2 Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, grader, roller, dragline
- 9.3 Asphalt mixer and tar boilers
- 9.4 Road pavers

- 10 Airport Engineering :- (10 hrs)

- 10.1 Necessity of study of airport engineering, aviation transport scenario in India.
- 10.2 Factors to be considered while selecting a site for an airport with respect to zoning laws.
- 10.3 Introduction to Runways, Taxiways and Apron

* **An expert may be invited from field/industry for extension lecture on this topic.**

PRACTICAL EXERCISES

- 1. Determination of penetration value of bitumen
- 2. Determination of softening point of bitumen
- 3. Determination of ductility of bitumen
- 4. Determination of impact value of the road aggregate
- 5. Determination of abrasion value (Los Angeles') of road aggregate
- 6. Determination of the California bearing ratio (CBR) for the sub-grade soil
- 7. Visit to Hot mix plant
- 8. Visit to highway construction site for demonstration of operation of:
Tipper, tractors (wheel and crawler), scraper, bulldozer, dumpers, shovels, grader, roller, dragline, road pavers, JCB etc.
- 9. Mixing and spraying equipment
- 10. A compulsory visit to Ready Mix Concrete plant.

INSTRUCTIONAL STRATEGY

While imparting instructions, it is recommended that emphasis should be laid on constructional details and quality control aspects. Students should be asked to prepare sketches and drawings, clearly indicating specifications and constructional details for various sub components of a highway. It will be also advantageous to organize field visits to show the actual construction of roads at site.

RECOMMENDED BOOKS

- i) Khanna, SK and Justo, CEG, "Highway Engineering", Nem Chand and Bros., Roorkee
- ii) Vaswani, NK, "Highway Engineering" , Roorkee Publishing House, Roorkee,
- iii) Priyani, VB, "Highway and Airport Engineering" Anand, Charotar Book Stall
- iv) Sehgal, SB; and Bhanot, KL; "A Text Book on Highway Engineering and Airport" S Chand and Co, Delhi
- v) Bindra, SP; "A Course on Highway Engineering" , Dhanpat Rai and Sons, New Delhi
- vi) Sharma, RC; and Sharma, SK; "Principles and Practice of Highway Engineering", Asia Publishing House, New Delhi
- vii) Duggal AK, Puri VP., "Laboratory Manual in Highway Engineering", New Age Publishers (P) Ltd, Delhi,
- viii) NITTTR, Chandigarh "Laboratory Manual in Highway Engineering",
- ix) RK Khitoliya, "Principles of Highway Engineering (2005)", Dhanpat Rai Publishing Co., New Delhi
- x) Rao, GV' Transportation Engineering
- xi) Duggal AK, "Maintenance of Highway – a Reader", NITTTR, Chandigarh
- xii) Duggal AK "Types of Highway constitution ", NITTTR Chandigarh
- xiii) Rao, "Airport Engineering"
- xiv) Singh,Jagrup, "Highway Engineering", Eagle Publications Jalandhar

IRC Publications

- i) MORTH Specifications for Road and Bridge Works (Fifth Revision)
- ii) MORTH Pocket book for Highway Engineers, 2001
- iii) MORTH Manual for Maintenance of Roads, 1983

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	10	12
3	10	12
4	10	12
5	12	14
6	06	08
7	06	08
8	06	08
9	08	10
10	10	12
Total	80	100

5.3 SURVEY CAMP

15 Days Duration

Purpose

- a) Making the students conversant with the camp life
- b) Providing an opportunity to the students to develop team spirit
- c) Training the students to communicate with the local population
- d) To impart intensive training in the use of all surveying instruments viz. Theodolite , Dumpy level, Compass, tachometer etc.
- e) To train the students to appreciate practical difficulties in surveying on the field
- f). To train the students for self management

Task:

Preparation of topographical plan of a given area. The survey camp will be organized for a duration of 15 days time span.

The students may be assigned an undulated area of about 1.5 to 2.00 sq.km. with level difference of 15m consisting of good number of physical features such as buildings, roads, bridges, culverts, railway tracks, electric lines etc. They are required to prepare the topographic map of above areas showing various features along with contours using a suitable contour intervals. They will mark a road alignment of given gradient connecting any two stations on the map consisting some horizontal and vertical curves and will prepare estimate of earthwork and submit the detailed technical report indicating therein practical difficulties faced during surveying for the features like ridge, line, valley lines, saddle cliffs etc.

The students should be divided in the groups consisting of 5-7 in numbers. They are required to submit the Report of workdone, during survey camp, which will be dully examined, while awarding the internal assessment.

5.4 COMPUTER APPLICATIONS IN HIGHWAY ENGINEERING

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RATIONALE

Computer applications plays 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 computers effectively in problem solving, this course offers applications of various computer softwares in highway engineering.

DETAILED CONTENTS

PRACTICAL EXERCISES

1. Demonstration of various civil engineering softwares like MS Project or Primavera Project Planner, Auto Civil, MX Road or any other equivalent software for above mentioned softwares

Note:

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

5.5 SOIL AND FOUNDATION ENGINEERING

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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 pre-requisite 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 aspect rather than theory.

DETAILED CONTENTS

THEORY

1. Introduction: (03 hrs)
 - 1.1 Importance of soil studies in Civil Engineering
 - 1.2 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, conditions in which above deposits are formed and their engineering characteristics.
 - 1.3 Names of organizations dealing with soil engineering work in India, soil map of India
2. Physical Properties of Soils: (04 hrs)
 - 2.1 Constituents of soil and representation by a phase diagram
 - 2.2 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
 - 2.3 Simple numerical problems with the help of phase diagrams

3. Classification and Identification of Soils (04 hrs)
 - 3.1. Particle size, shape and their effect on engineering properties of soil, particle size classification of soils
 - 3.2 Gradation and its influence on engineering properties
 - 3.3 Relative density and its use in describing cohesionless soils
 - 3.4 Behaviour of cohesive soils with change in water content, Atterberg's limit - definitions, use and practical significance
 - 3.5 Field identification tests for soils
 - 3.6 Soil classification system as per BIS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure for classification of a given soil

4. Flow of Water Through Soils: (04 hrs)
 - 4.1 Concept of permeability and its importance
 - 4.2 Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability
 - 4.3 Comparison of permeability of different soils as per BIS
 - 4.4 Measurement of permeability in the laboratory

5. Effective Stress: (Concept only) (04 hrs)
 - 5.1 Stresses in subsoil
 - 5.2 Definition and meaning of total stress, effective stress and neutral stress
 - 5.3 Principle of effective stress
 - 5.4 Importance of effective stress in engineering problems

6. Deformation of Soils (04 hrs)
 - 6.1 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
- 6.2 Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.
- 6.3 Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects
- 6.4 Settlement due to construction operations and lowering of water table
- 6.5 Tolerable settlement for different structures as per BIS
7. Shear Strength Characteristics of Soils: (09 hrs)
- 7.1. Concept and Significance of shear strength
 - 7.2 Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law
 - 7.3 Examples of shear failure in soils
8. Compaction: (04 hrs)
- 8.1 Definition and necessity of compaction
 - 8.2 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, jobs of an embankment supervisor in relation to compaction
9. Soil Exploration: (08 hrs)
- 9.1 Purpose and necessity of soil exploration
 - 9.2 Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly dealt)
 - 9.3 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.

9.4 Presentation of soil investigation results

10 Bearing Capacity of soil

(10 hrs)

10.1 Concept of bearing capacity

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

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

10.4 Factors affecting bearing capacity

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

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

10.7 Plate load test (no procedure details) and its limitations

10.8 Improvement of bearing capacity by sand drain method, compaction, use of geo-synthetics.

11. Foundation Engineering:

(10 hrs)

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, type of piles and their suitability; pile classification on the basis of material, pile group and pile cap.

PRACTICAL EXERCISES

1. To determine the moisture content of a given sample of soil
2. 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

3. Extraction of Disturbed and Undisturbed Samples
 - a) Extracting a block sample
 - b) Extracting a tube sample
 - c) Extracting a disturbed samples for mechanical analysis.
 - d) Field identification of samples

4. 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

5. 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

6. Mechanical Analysis
 - a) Preparation of sample
 - b) Conducting sieve analysis
 - c) Computation of results
 - d) Plotting the grain size distribution curve
 - e) Interpretation of the curve

7. 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

8. Demonstration of Unconfined Compression Test
 - a) Specimen preparation
 - b) Conducting the test
 - c) Plotting the graph
 - d) Interpretation of results and finding/bearing capacity

9. Demonstration of:
 - a) Direct Shear and Vane Shear Test on sandy soil samples
 - b) Permeability test apparatus

INSTRUCTIONAL STRATEGY

The teacher while imparting instructions are expected to lay greater emphasis on the practical aspects rather than theory and mathematical treatment. To bring clarity regarding concepts and principles involved, teachers should organize demonstrations in the laboratories and fields. It is necessary to create understanding that soils fail either under shear or settlement due to heavy loads. This can be shown by making use of photographs on working models of such failures. Efforts should be made in the practical classes that students perform practical exercises individually. Conduct of viva examination at the end of each practical work will develop clear understanding about the concepts and principles related to this subject.

RECOMMENDED BOOKS

- i) Punmia, BC, "Soil Mechanics and Foundations"; Standard Publishers, Delhi
- ii) Bharat Singh and Shamsher Prakash; "Soil Mechanics and Foundations Engineering", Nem Chand and Bros, Roorkee,
- iii) Sehgal, SB, "A Text Book of Soil Mechanics"; CBS Publishers and Distributors, Delhi,
- iv) Gulati, SK and Manoj Dutta, "Geotechnical Engineering ", Tata McGraw Hill, Delhi,
- v) Ranjan Gopal and Rao ASR "Basic and Applied Soil Mechanics", New Age Publication (P) Ltd., New Delhi
- vi) Singh Harbhajan "Soil and Foundation Engineering", Abhishek Publishers, Chandigarh
- vii) S Mittal and JP Shukla, "Soil Testing for Engineers", Khanna Publishers Ltd., Delhi
- viii) BIS Codes IS 6403 (latest edition) and IS 1498 (latest edition)
- ix) Jagroop Singh, "Soil and Foundation Engineering", Eagle Parkashan, Jalandhar
- x) Rabinder Singh, " Soil and Foundation Engg." SK Kataria and Sons, Ludhiana
- xi) NITTTR, Chandigarh, "Shallow Foundations"
- xii) Video films on Geo-technical Laboratory Practices by NITTTR, Chandigarh

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	03	05
2	04	06
3	04	06
4	04	06
5	04	06
6	04	06
7	09	14
8	04	06
9	08	16
10	10	12
11	10	17
Total	64	100

5.6 ENVIRONMENTAL EDUCATION

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RATIONALE

Education about environment protection is a must for all the citizens. In addition, a diploma holder must have knowledge of different types of pollution caused by industries and construction activities so that he may help in balancing the eco system and controlling pollution by adopting pollution control measures. He should also be aware of environmental laws related to the control of pollution.

DETAILED CONTENTS

1. Definition, Scope and Importance of Environmental Education (02 hrs)
2. Basics of ecology, biodiversity, eco system and sustainable development (03 hrs)
3. Sources of pollution - natural and manmade, causes, effects and control measures of pollution (air, water, noise, soil, radioactive and nuclear) and their units of measurement (12 hrs)
4. Solid waste management – Causes, effects and control measures of urban and industrial waste (06 hrs)
5. Mining and deforestation – Causes, effects and control measures (04 hrs)
6. Environmental Legislation - Water (prevention and control of pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board, Environmental Impact Assessment (EIA) (10 hrs)
7. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio Energy, Hydro Energy) (04 hrs)
8. Current Issues in Environmental Pollution – Global Warming, Green House Effect, Depletion of Ozone Layer, Recycling of Material, Environmental Ethics, Rain Water Harvesting, Maintenance of Groundwater, Acid Rain, Carbon Credits. (07 hrs)

INSTRUCTIONAL STRATEGY

The contents will be covered through lecture cum discussion sessions. In addition, in order to have more appreciation of need for protection of environment, it is suggested that

different activities pertaining to Environmental Education like video films, seminars, environmental awareness camps and expert lectures may also be organized.

RECOMMENDED BOOKS

1. Environmental Engineering and Management by Suresh K Dhameja; SK Kataria and Sons, New Delhi.
2. Environmental Science by Dr. Suresh K Dhameja; SK Kataria and Sons, New Delhi.
3. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
4. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
5. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
7. Environmental Studies by Erach Bharucha; UGC University Press.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	02	04
2	03	06
3	12	24
4	06	12
5	04	10
6	10	20
7	04	10
8	07	14
Total	48	100

5.7 STRUCTURAL DRAWINGS

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RATIONALE

Diploma holders in Civil Engineering are required to supervise the construction of RC and steel structures. Thus one should be able to read and interpret structural drawings of RC and steel structures. The competence to read and interpret structural drawings is best learnt by being able to draw these drawings. Hence there is a need to have a subject devoted to preparation of structural drawings.

DETAILED CONTENTS PART A

Drawing Exercises

1. RC Structures:

Reinforcement details from the given data for the following structural elements with bar bending schedules

- (i) Drawing No. 1: RC Slabs - One way slab, Two way slab and Cantilever Slab.
- (ii) Drawing No.2 : Beams - Singly and doubly reinforced rectangular beams and Cantilever beam (All beams with vertical stirrups)
- (iii) Drawing No.3 : Columns and Footings – Square, Rectangular and Circular Columns with lateral ties and their isolated sloped column footings.
- (iv) Drawing No. 4 : Portal Frame – Three bay two storey RC portal frame with blow up of column beam junctions.
- (v) Drawing No.5: Dog legged stairs for single storey building
- (vi) Drawing No.6 : Draw atleast one sheet using CAD software

PART B

2. Steel Structures:

Structural drawing from given data for following steel structural elements.

- (i) Drawing No. 1: Roof Truss – Drawing of Fink Roof Truss with details of joints, fixing details of purlins and roof sheets.
- (ii) Drawing No.2 : Column and Column Bases - Drawing of splicing of steel columns. Drawings of slab base, gusseted base and grillage base for single section steel columns.

(iii) Drawing No.3 : Column Beam Connections

- (a) Sealed and Framed Beam to Beam Connections
- (b) Sealed and Framed beam o Column Connections

(iv) Drawing No. 4 : Plate Girder

Plan and Elevation of Plate Girder with details at supports and connection of stiffness, flange angles and cover plate with web highlighting curtailment of plates.

(v) Drawing No. 5 : Draw atleast one sheet using CAD software

RECOMMENDED BOOKS

1. Loyal JS “Civil Engineering Drawing”, Satya Parkashan, New Delhi
2. Chandel RP “ Civil Engineering Drawings”
3. Kumar; NS “ Civil Engineering Drawing “ IPH, New Delhi
4. Malik RS and Meo GA, “Civil Engineering Drawing” Asian Publishing House, New Delhi
5. Singh, Birinder “RCC Design and Drawing” Kaption Publishing House, New Delhi.
6. Singh, Birinder “Steel Structures Design and Drawing”, Kaption Publishing House, New Delhi
7. Singh, Harbhajan, “Structural Drawings”, Abhishek Publishers, Chandigarh
8. B.V. Sikka, Civil Engineering Drawing.

5.8 EMPLOYABILITY SKILLS – I

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RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market and survive in cut throat competition among professionals.

DETAILED CONTENTS

1. Writing skills (08 hrs)
 - i) Official and business correspondence
 - ii) Job application - covering letter and resume
 - iii) Report writing - key features and kinds

2. Oral Communication Skills (20 hrs)
 - i) Giving advice
 - ii) Making comparisons
 - iii) Agreeing and disagreeing
 - iv) Taking turns in conversation
 - v) Fixing and cancelling appointments

3. Generic Skills (04 hrs)
 - i) Stress management
 - ii) Time management
 - iii) Negotiations and conflict resolution
 - iv) Team work and leadership qualities

5.9 TRAFFIC ENGINEERING

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RATIONALE

The subject aims to cater to the needs of diploma holders who will work in the area of Traffic Engineering. It provides broad based knowledge regarding various basic concepts concerning Traffic Engineering.

DETAILED CONTENTS

1. Introduction: (05 hrs)
Traffic Engineering – Definition, importance, functions of a traffic engineer. Road user human factors and behaviour, vehicular characteristics, slow moving traffic in India
2. Speed and Travel time: (09 hrs)
Speed-Spot speed, journey speed, and running speed, journey speed and delays,
 - Measurement of spot speed: Base length, methods of measurement, enoscope, pressure contact tubes, radar speed meter, photographic method
 - Measurement of running speed and journey speed
 - Presentation of sport speed data – histograms and frequency curves
3. Traffic Volume Studies: (07 hrs)
Vehicle volume, classification and occupancy counts – concept and objectives, types of vehicle volume, data representation – ADT, AADT etc., techniques of measurement – manual, mechanical, moving observer, photographic method etc., their description
4. Traffic Surveys (06 hrs)
 - Origin and destination surveys: Concept, need for O and D survey, survey methods-brief description
 - Parking Surveys: Types of parking surveys, parking space inventory
5. Traffic signs and road markings: (07 hrs)
 - Importance, type of traffic signs, router marker signs – location, height and maintenance of traffic signs
 - Road Markings: Functions, types, material and colour, centre line, edge markings, stop lines, pedestrian crossing, no overtaking zone markings, route direction arrows

6. Miscellaneous Traffic Control Aids (08 hrs)
 Traffic Aids: Roadway delineators, Hazard markers, object marker, speed breakers, rumble strips-their design and specifications as per IRC standards, Guard rails for pedestrians
7. Parking: (06 hrs)
 Parking problems, zoning and parking space requirements standards. Design standards for on street parking, off-street parking facilities, methods of parking

INSTRUCTIONAL STRATEGY

The teacher while imparting instructions are expected to lay greater emphasis on the practical aspect of the subject in the field. To bring clarity regarding basics, teachers may invite some experts from the field.

RECOMMENDED BOOKS

1. Traffic Engineering and transport planning by LR Kadiyali, Khanna Publishers, Delhi
2. Traffic Engineering by TM Maston et al., McGraw Hill Book Cooperation, New York
3. IRC recommended Practice for Traffic Engineering

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	10
2	09	20
3	07	14
4	06	12
5	07	14
6	08	18
7	06	12
Total	48	100

PERSONALITY DEVELOPMENT AWARENESS CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person Interviews; Telephonic Interview' Panel interviews; Group interviews and Video Conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene