

**Invertis Institute of Engineering & Technology**  
**INVERTIS UNIVERSITY**  
Invertis Village, Bareilly-Lucknow NH-24, Bareilly

**Scheme of Instruction & Syllabi**  
**of**  
**Diploma in Civil Engineering**  
**(Three Year Diploma Course)**  
**III Year**

(Effective Session 2017-2018)

**STUDY AND EVALUATION SCHEME**  
**Diploma in Civil Engineering**  
**(Effective from session 2017-2018)**  
**YEAR III, SEMESTER V**

| S. No.                            | Course Code | SUBJECT   | PERIODS   |          |           | EVALUATION SCHEME |           |           |            |            |            | TOTAL     | Credit |
|-----------------------------------|-------------|---|-----------|----------|-----------|-------------------|-----------|-----------|------------|------------|------------|-----------|--------|
|                                   |             |   |           |          |           | SESSIONAL EXAM.   |           |           |            | E-SEM.     |            |           |        |
|                                   |             |   | L         | T        | P         | CT                | TA        | AT        | TOTAL      |            |            |           |        |
| <b>THEORY</b>                     |             |   |           |          |           |                   |           |           |            |            |            |           |        |
| 1                                 | DCE501      | Transportation Engineering – I                          | 3         | 1        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |        |
| 2                                 | DCE502      | Surveying – II  | 3         | 1        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |        |
| 3                                 | DCE503      | Construction Management                                 | 4         | 0        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |        |
| 4                                 | DCE504      | Earthquake Engineering                                  | 3         | 1        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |        |
| 5                                 | DCE505      | Public Health Engineering – II                          | 3         | 1        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |        |
| <b>PRACTICAL/TRAINING/PROJECT</b> |             |   |           |          |           |                   |           |           |            |            |            |           |        |
| 6                                 | DCE551      | Transportation Engineering Lab                          | 0         | 0        | 3         | -                 | -         | -         | 50         | 50         | 100        | 2         |        |
| 7                                 | DCE552      | Surveying Lab – II and Survey Camp of one week duration | 0         | 0        | 6         | -                 | -         | -         | 50         | 50         | 100        | 3         |        |
| 8                                 | DCE553      | Mini Project work                                       | 0         | 0        | 2         | -                 | -         | -         | 100        | 100        | 200        | 3         |        |
| 9                                 | GP501       | General Proficiency                                     | -         | -        | -         | -                 | -         | -         | 50         | -          | 50         | 1         |        |
|                                   |             | <b>TOTAL</b>  | <b>16</b> | <b>4</b> | <b>11</b> | <b>100</b>        | <b>50</b> | <b>50</b> | <b>450</b> | <b>500</b> | <b>950</b> | <b>29</b> |        |

**L**-Lecture, **T**- Tutorial , **P**- Practical , **CT** – Cumulative Test ,**TA** –Teacher Assessment ,  
**AT** – Attendance , **E-Sem** – End Semester Marks

**STUDY AND EVALUATION SCHEME**  
**Diploma in Civil Engineering**  
**(Effective from session 2017-18)**  
**YEAR III, SEMESTER VI**

| S. No.   | Course Code | SUBJECT                            | PERIODS   |          |           | EVALUATION SCHEME |           |           |            |            | TOTAL      | Credit    |
|--|-------------|------------------------------------|-----------|----------|-----------|-------------------|-----------|-----------|------------|------------|------------|-----------|
|  |             |                                    |           |          |           | SESSIONAL EXAM.   |           |           |            | E-SEM.     |            |           |
|  |             |                                    | L         | T        | P         | CT                | TA        | AT        | TOTAL      |            |            |           |
| <b>THEORY</b>  |             |                                    |           |          |           |                   |           |           |            |            |            |           |
| 1  | DCE601      | Design of RCC Structures           | 3         | 1        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |
| 2  | DCE602      | Design of Steel Structures         | 3         | 1        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |
| 3  | DCE603      | Transportation Engineering – II    | 3         | 1        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |
| 4  | DAS604      | Environmental and Ecology          | 2         | 0        | 0         | 10                | 05        | 05        | 20         | 30         | 50         | 2         |
| 5  | DCE605      | Estimation , Costing and valuation | 3         | 1        | 0         | 20                | 10        | 10        | 40         | 60         | 100        | 4         |
| <b>PRACTICAL/TRAINING/PROJECT</b>  |             |                                    |           |          |           |                   |           |           |            |            |            |           |
| 6  | DCE651      | RCC Lab                            | 0         | 0        | 3         | -                 | -         | -         | 50         | 50         | 100        | 2         |
| 7  | DCE652      | Major Project                      | 0         | 0        | 8         | -                 | -         | -         | 150        | 200        | 350        | 8         |
| 8  | GP601       | General Proficiency                | -         | -        | -         | -                 | -         | -         | 50         | -          | 50         | 1         |
|  |             | <b>TOTAL</b>                       | <b>14</b> | <b>5</b> | <b>11</b> | <b>90</b>         | <b>45</b> | <b>45</b> | <b>430</b> | <b>520</b> | <b>950</b> | <b>29</b> |
| <b>L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks</b> |             |                                    |           |          |           |                   |           |           |            |            |            |           |

# TRANSPORTATION ENGINEERING – I

## Fifth Semester

Course Code: DCE 501

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | - | 4 |

### Course

#### Contents: Unit I

#### HIGHWAYS

**Introduction:** (i) Importance of Highway transportation. (ii) Functions of IRC. (iii) IRC classification of roads. (iv) Organization of state highways department.

**Road Geometrics:** (i) Glossary of terms used in geometrics and their importance; Right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient. (ii)

Drawing of typical cross-sections in cutting and filling on straight. (iii) Under pass & over pass (flyovers and bridges) Highway Surveys and Plans.

(i) Basic considerations governing alignment for a road in plain and hilly area.

(ii) Highway location.

#### Unit II

##### Marking of alignment.

**Traffic Engineering:** (i) Traffic control devices - Signs, markings and signals, their effectiveness and location, installation of signs, IRC standards. (ii) Segregation of traffic. (iii) Types of intersections and how to choose them. (iv) Accidents: Types, causes and remedies.

**Road Materials:** (i) Different types of road materials in use; soil, aggregates binders. (ii) Function of soil as Highway sub grade. (iii) C.B.R; Method of finding. CBR value and its significance. (iv) Aggregates : Availability of road aggregates in India, requirements of road aggregates as per IS specifications. (v) Binders: Common binders; cement, bitumen and Tar, properties as per IS specifications, penetration and viscosity test , procedures and significance. cut back and emulsion and their uses.

#### Unit III

**Road Pavements ; Types and Their Construction:** (i) Road pavement : Flexible and rigid pavement, their merits and demerits, typical cross-sections , functions of various components. (ii) 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, stabilization, preparation of sub grade. methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for sub grade preparation. (iii) Flexible pavements: sub base necessity and purpose. stabilized sub base; purpose of stabilization.

**Types of Stabilization:** (a) Mechanical stabilization. (b) Lime stabilization. (c) Cement stabilization. (d) Fly ash stabilization. (e) Granular sub base

(iv) **Base course:** (a) Brick soling. (b) Stone soling. (c) Medaling: water bound macadam and bituminous macadam. Methods of construction as per Ministry of Shipping and transport (Government of India).

##### (v) Surfacing:

**Types of surfacing:** (a) Surface dressing. (b) (i) Premix carpet. (ii) Semi dense carpet (S.D.C)

(c) Asphalt concrete. (d) Grouting.

Methods of constructions as per Ministry of Surface and Transport, Government of India, specifications and quality control; equipment used.

(vi) **Rigid pavements:** Construction of concrete roads as per IRC specifications:

Form laying, mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipment used.

#### Unit IV

**Hill Roads:** (i) **Introduction:** Typical cross-sections showing all details of a typical hill road in cut, partly in cut and partly in fill. (ii) **Landslides :** Causes, preventions and control measures.

**Road Drainage:** (i) Necessity of road drainage work, cross drainage works. (ii) 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.

**Road maintenance:** (i) Common types of road failures-their causes and remedies. (ii) Maintenance of bituminous roads such as patch work and resurfacing. Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices.

## Unit V

**Construction Equipment:** Output and use of the following plant and equipments:

(i) Hot Mix Plant. (ii) Tipper, tractors (wheel and crawler) scraper, bull-dozer, dumpers, shovels, grader, roller, dragline. (iii) Asphalt mixer and tar boilers. (iv) Road pavers.

**Arboriculture:** Names of trees used in arboriculture, distance of trees from centre of roads and distance between centre to centre of trees, tree guards, maintenance and revenue from trees.

### Text Books:-

1. Gupta B.L., *Road, Railway, Bridges, Tunnels & Harbour Dock Engineering*, Standard Publishers Distributors, Delhi.
2. Rangwala S.C., *Highway Engineering*, Charotar Publishing House (P) Ltd., Anand.
3. Ahuja & Birdi, *Road, Railway, Bridges & tunnels Engineering*, Standard Books House, Delhi.

### Reference Books:-

1. Khana S.K. & Justo, *Highway Engineering*, Nem Chand & Bros., Roorkee.
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## SURVEYING – II

### Fifth Semester

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|          | 1-       | -        | 4        |

Course Code: DCE 502                      3

#### Course Contents:

##### Unit I

##### Plane Table surveying

- (i) Purpose of plane table surveying. Equipment used in plane table survey  
(a) Plane table, (b) Alidade (Plain and Telescopic), (c) accessories.
- (ii) Method of plane tabling (a) centering (b) leveling (c) Orientation.
- (iii) Methods of plane table surveying (a) Radiation, (b) Intersection, (c) Traversing (d) Resection.
- (iv) Two point problem.
- (v) Three point problem by  
(a) Mechanical Method (Tracing paper), (b) Bessel's Graphical Method.  
(c) Trial and error method.

Errors in plane table survey and precautions to control them.

##### Unit II

**Contouring:** Concept of contour: Purpose of contouring; Contour interval and horizontal equivalent; Factors affecting contour interval; characteristics of contour; Methods of contouring direct and indirect, use of stadia measurements in contour survey. Interpolation of contours; Use of contour map; Drawing cross section from a contour map; Marking alignment of a road, railway and a canal on a contour map; Computation of earthwork and reservoir capacity from a contour map.

##### Unit III

**Theodolite Surveying:** Working of a transit vernier theodolite, Fundamental axes of a theodolite and their relation; Temporary adjustments of a transit theodolite; least count and concept of transiting, swinging, face left, face right and changing face; Measurement of horizontal and vertical angles. Prolonging a line (forward and backward) Measurement of bearing of a line; Traversing by included angles method; traversing by stadia measurement; Theodolite triangulation and plotting a traverse; concept of coordinate. Errors in theodolite survey and precautions taken to minimize them; Limits of precision in theodolite traversing. Principle and working of a Electronic theodolite. Brief introduction to tachometry.

Total Station & Auto Level : Working and application of total station and auto level.

##### Unit IV

**Curves: Simple circular curves:** Need and definition of a simple circular curve; Elements of simple circular curve, Degree of the curve, radius of the curve, tangent length, point of intersection (Apex point), tangent point, length of curve, long chord, deflection angle, apex distance and mid-ordinate. Setting out of simple circular curve: (a) By linear measurements only: - Offsets from the tangents.- Successive bisection of arcs. - Offsets from the chord produced. (b) By Tangential angles using a theodolite.

##### Unit V

**Transition Curves:** Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curves; length of transition curves for roads by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets only. **Vertical curves:** Setting out of a vertical curve.

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**Text Books:-**

1. Arora K.R., *Surveying Vol. I & II*, Standard Book House, Delhi.
2. Kanetkar T.P., *Surveying & Levelling Vol. I & II*, Pune VidyarthiGrihaPrakashan, Pune.
3. Basak P.N., *Surveying & Leveling*, Tata McGraw – Hill Publishing Co. Ltd., Delhi.
4. Agarwal G.D., *Surveying Vol. I & II*, Unitech Publishers, Lucknow.
5. Dass G., *Surveying Vol. I & II*, Nav Bharat Prakashan, Meerut.

**Reference Books:-**

1. Punmia B.C., *Surveying Vol. I & II*, Laxmi Publications (P) Ltd. New Delhi.
2. Guggal S.K., *Surveying Vol. I & II*, New Age International Publishers New Delhi.
3. Chandra A.M., *Surveying Problem Solving with Theory & Objective Type Questions*, New Age International Publishers New Delhi.

# CONSTRUCTION MANAGEMENT

## Fifth Semester

Course Code: DCE503

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 3 |

### Course Contents:

#### Unit I

**Introduction:** (i) Classification of construction into light, heavy and industrial construction. (ii) Stages in construction from conception to realization. (iii) The construction team: Owner, engineer and contractors, their functions and interrelationship. (iv) Resources for construction industry; men, machines, materials, money and management. (v) Main objectives of Civil engineering management. (vi) Functions of construction management, planning, organizing, staffing, directing, controlling and co-ordination, meaning of each of these with respect to a construction job.

#### Unit II

**Construction Planning:** (i) Stages at which planning is done. Pre tender and contract planning by the contractor. (ii) Scheduling: Definition, Methods of scheduling: bar charts and CPM, advantages of scheduling. No problem on CPM to be set in the examination. (iii) Planning and scheduling of construction jobs by bar charts. (iv) Preparation of construction schedule, labour schedule, material schedule, and equipment schedule. (v) Limitations of bar charts. (vi) Cost-time balancing.

#### Unit III

**Organization:** (i) Types of organization: Line, staff, functional and their characteristics. (ii) Principles of organization; (only meanings of the following and their significance); Span of control ; Delegation of authority and responsibility; Ultimate authority and responsibility; Unity of command; contact; unity of assignment; job definition; increasing organization relationship. (iii) Motivation and human relationship concept, need and fundamentals.

**Site Organization:** (i) Factors influencing, job layout from site plan. (ii) Principle of storing and stacking materials at site. (iii) Location of equipment. (iv) Preparation of actual job layout for a building. (v) Organizing labour at site.

#### Unit IV

**Construction Labour:** (i) Conditions of construction workers in India, wages paid to workers. (ii) Trade unions connected with construction industry and trade Union Act. (iii) Labour welfare. (iv) Payment of wages Act. Minimum wages Act. (v) Workmen compensation Act. (vi) Contract Labour Act.

**Control of Progress:** (i) Methods of recording progress. (ii) Analysis of progress. (iii) Taking corrective actions keeping head of office informed.

#### Unit V

**Inspection and Quality Control:** (i) Principles of inspection. (ii) Major items in construction job requiring quality control.

**Accidents and Safety in Construction:** (i) Accidents - causes. (ii) Safety measures for: - (a) Excavation work (b) Drilling and blasting. (c) Hot bituminous works. (d) Scaffolding, ladders, form work. (e) Demolitions. (iii) Safety campaign. Professional practice.

#### Text Books:-

1. Sadimala C.M., *Materials and Financial Management*, New Age International Publishers, Delhi.

#### Reference Books:-

1. Gahlot P.S., *Construction Planning and Management*, International Publishers, Delhi.



## EARTHQUAKE ENGINEERING

### Sixth Semester

|                             |          |          |          |          |
|-----------------------------|----------|----------|----------|----------|
| <b>Course Code: DCE 504</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                             | <b>3</b> | <b>1</b> | <b>-</b> | <b>4</b> |

#### **Course Contents:**

##### **Unit:- I**

Causes of earthquakes and seismic waves, magnitude, intensity and energy release, Basic terminology, Characteristics of earthquakes, Seismic hazard, vulnerability and risk, Seismic Zoning. Earthquakes performance of structures in past earthquakes.

##### **Unit:- II**

Philosophy of earthquake resistant design and concept of ductility, Short and long period structures, Concept of spectrum, Static force calculations. Architectural considerations : Building simplicity, symmetry. Irregularities, Continuity and Uniformity.

##### **Unit:- III**

Effect of soils and liquefaction, Remedial measures, Construction of earth structures. Seismic construction of masonry buildings, provisions of IS:4326.

##### **Unit:- IV**

Seismic construction of RC buildings detailing, provisions of IS: 13920. Retrofitting of masonry and reinforced concrete buildings.

##### **Unit:- V**

#### **DISASTER MANAGEMENT :**

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

#### **Text Books:-**

1. Srivastava H.N., *Earthquakes Geography and Management*, New Age International Publishers, Delhi.
2. Jai Krishna, *Elements of Earthquake Engineering*, South Asian Publishers, New Delhi.
3. Chopra A.K., *Dynamics of Structure*, Pearson Education.

#### **Reference Books:-**

1. Agarwal P.N., *Engineering Seismology*, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Richter C.F., *Elementary Seismology*, Eurasia Publishing House Pvt. Ltd., New Delhi.
3. IS: 4326 India Standard- "Earthquake Resistant Design and Construction of Buildings – Code of Practice" Bureau of Indian Standard, New Delhi.
4. IS: 13920 India Standard- "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces" Bureau of Indian Standard, New Delhi.

**PUBLIC HEALTH ENGINEERING – II**  
**Fifth Semester**

|                             |          |          |          |          |
|-----------------------------|----------|----------|----------|----------|
| <b>Course Code: DCE 505</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                             | <b>3</b> | <b>1</b> | <b>-</b> | <b>4</b> |

**Course Contents:**

**Unit:- I**

**(B) SANITARY ENGINEERING**

**Introduction:** Waste: Dry, semi liquid, liquid, Necessity of systematic collection and disposal of waste. Brief description of sewage disposal system. Conservancy and water carriage system, their advantages and disadvantages.

**Quantity of Sewage:** (i) Sewage: Domestic, industrial and storm water. (ii) Volume of domestic sewage (DWF), variability of flow, limiting velocities in sewers. (iii) Use of table as per I:S 1742-1983 to determine relationship between gradient, diameter, discharge and velocity.

**Unit:- II**

**Sewerage Systems:** (i) Types of sewerage systems separate, combined and partially separate. (ii) Sewers : Stoneware, cast iron, concrete and masonry sewers their sizes and joints. (iii) Appurtenances: (Location, function and construction) manholes, drop manhole, lamp hole catch basin, inverted siphon, flushing tanks, ventilating shafts and storm water flows. (iv) **Laying of sewers:** Setting out alignment of sewer. Excavation, checking the gradient with the help of boning rods, preparation of bedding, handling, lowering, laying and jointing, testing and backfilling. (v) Construction of surface drains and different sections required.

**Unit:- III**

**Building Drainage:** (i) Aims of building drainage and its requirements. General layout of sanitary fittings and house drainage arrangement for a building (single and multistoried) as per IS 1742-1983. (ii) Different sanitary fittings and their installation. (iii) Traps, seal in traps, causes of breaking of seal, precautions taken, Gully,

Intercepting and Grease traps.

**Unit:- IV**

**Rural Sanitation:** (a) Drainage: Topography, alignment of lanes, storm water, natural passage, development of drains, alignment, size and gradient. Phase Programme. (b) Disposal of night soil and village latrines: (i) Collection and disposal of garbage and refuse.

**Unit:- V**

**Maintenance:** Inspection of mains, cleaning and flushing of sewers. Precautions during cleaning, maintenance of traps, cleaning of house drainage line. Tools and equipment needed for maintenance.

**Sewage Treatment:** (i) Meaning and principle of primary and secondary treatment, constructional details of screening chamber, grit chamber, clarifier, trickling filters, secondary clarifiers/aeration tank. (ii) Sludge treatment, sludge digestion, sludge drying, sludge disposal (iii) Oxidation ponds.

**Text Books:-**

1. Rangwala S.C, *Water Supply & Sanitary Engineering*, Charotar Publishing House (P) Ltd., Anand.
2. Gurcharan Singh, *Water Supply & Sanitary Engineering*, Standard Publishers Distributors, Delhi.
3. Garg S.K., *Water Supply Engineering*, Khanna Publishers, Delhi.
4. Gupta D.V., *Water Supply & Sanitary Engineering*, Asian Publishers, Muzaffarnagar.

**Reference Books:-**

1. Modi P.N., *Water Supply Engineering*, Standard Book House, Delhi.

## TRANSPORTATION ENGINEERING LAB

### Fifth Semester

Course Code: DCE 551

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

#### List of Experiments

1. Determination of resistance to abrasion of aggregates by Los Angel's Abrasion Testing Machine.
2. Determination of Aggregate impact value by aggregate impact tester.
3. Determination of C.B.R. Value of sub grade soil.
4. Determination of Aggregate crushing value by aggregate crushing test apparatus.
5. Determination of Penetration Value of bitumen.
6. Determination of softening point of bitumen.
7. Determination of ductility of bitumen.
8. Determination of flash and fire point of bitumen.

#### Field Visits of at least one of the following (in different fields):

1. Railway yard and station, points and crossing, rack, communication, control and panel Board.
  2. Railway Museum for the development of Railways, Rails Mono Rails, Sleepers--R.D.S.O. Lucknow & Rail Bhawan Delhi
  3. Bridges under construction.
  4. Grade separator.
  5. Factory for construction of prestressed sleepers or other fixtures.
  6. P.W.D. Research Lab at Lucknow/C.B.R.I. Roorkee.
  7. Hume Pipe Factory.
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**SURVEYING LAB – II**  
**[INCLUSIVE OF SURVEY CAMP OF ONE WEEK DURATION]**  
**Fifth Semester**

|                             |          |          |          |          |
|-----------------------------|----------|----------|----------|----------|
| <b>Course Code: DCE 552</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                             | -        | -        | <b>6</b> | <b>3</b> |

**1. Plane Tabling:-**

- Ex. (i) (a)** Setting the plane table  
    **(b)** Marking the North direction.  
    **(c)** Plotting a few points by Radiation method.
- Ex. (ii)**      **(a)** Orientation by  
    - Trough compass  
    - back sighting.  
    **(b)** Plotting a few points by Intersection method.
- Ex. (iii)**      Traversing an area with a plane table (at least five lines)
- Ex. (iv)**      **(a)** Two point problem.  
    **(b)** Three point problem by  
    - Tracing paper method.  
    - Bessel's graphical method.  
    - Trial and error method.

**(B) Contouring:-**

- Ex. (v)**      Preparing a contour plan by radial line, method by the use of a Tangent clinometers/Tachometer.
- Ex. (vi)**      Preparing a contour plan by method of squares.

**(C) Theodolite:-**

- Ex. (vii)**     Drill for taking out, the Theodolite Mounting on the tripod and placing it back in the Box.
- Ex. (viii)**    Reading the vernier and working out the least count. Measurement of horizontal angles by repetition and reiteration method.
- Ex. (ix)**      Traversing an area with a Theodolite (at least five lines) and Plotting the traverse by calculating Latitude and Departure.
- Ex. (x)**        Measurement of vertical angles by the use of Theodolite.
- Ex. (xi)**       Measurement of Magnetic Bearing of a line.
- Ex. (xii)**     Measurement of horizontal & vertical angles with Electronic Theodolite/Total station.

**(D) Curves:-**

- Ex. (xiii)**    Setting out a Simple Circular Curve with given data by the following methods -  
    **(a)** Offsets from main chord.  
    **(b)** Offsets from the chords produced.  
    **(c)** One Theodolite method.
- Ex. (xiv)**     Setting out a circular curve with transition length by linear measurements.

Survey camp of one week duration shall be arranged in the University campus or nearby locality to enhance the actual Practical knowledge of site surveying. The students are supposed to do topographical survey of the area showing contours and other features on site map.

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# DESIGN OF REINFORCED CONCRETE (RCC) STRUCTURE

## Sixth Semester

Course Code: DCE 601

| L | T | P | C |
|---|---|---|---|
| 3 | 2 |   | 4 |

### Course Contents:

#### Unit:- I

**Introduction:** Concept of reinforced concrete structures, advantages and disadvantages. Different materials used in RCC with their properties. Load and loading standard as per IS:875 Concept of design of reinforced concrete based on working stresses method and limit state method and their difference.

**(A) Design based on Working Stress Method:** Fundamental of working stress method: **(i)** Assumptions in the theory of simple bending for RCC beams. **(ii)** Flexural strength of a singly reinforced RCC beam. Position of the Neutral Axis. Resisting moment of the section, critical neutral axis, actual neutral axis, concept of balanced, under reinforced and over-reinforced sections. **(iii)** Shear Strength : Permissible shear stresses as per IS:456 – 2000. Development of stresses in reinforcement, development length and anchoring of bars. **(iv)** Bond Strength: Concept of bond, local and average, permissible bond stresses for plain and deformed bars as per IS, minimum length of embedment of bars, minimum splice length, actual bond stress in RCC beams and slabs, bond length as per IS: 456 – 2000. Design of singly reinforced concrete beams as per IS:456 – 2000 from the given data such as span, load and properties of materials used. Design of lintel.

#### Unit:- II

**Design of a cantilever beam and slab. Design of Doubly Reinforced Concrete Beams:** **(i)** Doubly reinforced concrete beam and its necessity., **(ii)** Strength of a double reinforced concrete beam section., **(iii)** Method of design: Simple problems only. **(iv)** Reinforcement details of doubly reinforced concrete beam.

**Design of RCC Slabs:-** **(i)** Structural behavior of slabs under uniformly distributed load (UDL)., **(ii)** Types of end supports., **(iii)** Design of one way slab., **(iv)** Design of Two-way slab with the help of tables of IS:456 – 2000.(Corners not held down)-IS-code method., **(v)** Detailing of reinforcement.

#### Unit:- III

**Design of Tee Beams:-** **(i)** Structural behaviour of a beam and slab floor laid monolithically., **(ii)** Rules for the design of T-Beams., **(iii)** Economical depth of T-Beams, Strength of T-Beams., **(iv)** Design of singly reinforced Tee-Beams., **(v)** Detailing of reinforcement.

#### Unit:- IV

**Design of Columns & Column Footings:-** **(i)** Concept of long and short columns. **(ii)** Specifications for main and lateral reinforcement. **(iii)** Behavior of RCC column under axial load. **(iv)** Design of Axially loaded short and long columns with hinged ends (circular, square and rectangular as per IS specifications). **(v)** Concept of column footing. Design criteria. Design of square isolated column footings. **(vi)** Detailing of reinforcement.

**Cantilever Retaining Wall:-** Concept of design and function of different parts of a cantilever retaining wall and reinforcement details (No numerical shall be asked in the examination).

#### Unit:- V

**Design Based on Limit State Method:- Fundamentals of Limit State Method** **i.** Theory of limit state method. **ii.** Partial safety factors. **iii.** Flexural strength. **iv.** Shear Strength. **v.** Development Length of bars. Design requirements.

**Design of the following :** **i.** Singly reinforced rectangular beam. **ii.** One way slab simply supported

#### Text Books:-

1. S.K. Mallick, *Reinforced Concrete*, Oxford & IBH Publishing Co., Delhi.
2. Ashok K. Jain, *Reinforced Concrete by Limit State Design* by Nem Chand & Bros., Roorkee.

#### Reference Books:-

1. Punmia B.C., *Limit State Design of Reinforced Concrete*, Laxmi Publication (P), Delhi.
2. Raju N.K., *Reinforced Concrete Design IS 456 – 2000 Principles & Practice*, New Age International Publishers, New Delhi.

3. BIS, *IS 456 – 2000 Code of Practice for Plain & Reinforced Concrete*.

# DESIGN OF STEEL STRUCTURES

## Sixth Semester

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**Course Code: DCE 602**

**Course Contents:**

**Unit:- I**

**Structural Steel and Sections:** (ii) Properties of structural steel as per IS:226 and IS:1977, Designation of structural steel sections as per IS Handbook and IS:800.

**Structural Steel Connections:** (i) **Riveted connections** - types of rivets, permissible stresses in rivets. Types of riveted joints, Failure of riveted joints, Assumptions made in the design of riveted joints. Specification for riveted joints. Design of riveted joints for axially loaded members.

(ii) **Welded Connections:-** Comparison between riveted and welded joints, types of welds, permissible stresses in welds, types of welded connections, strength of welded joint, Design of welded joints for axially loaded members.

(iii) Introduction to Bolted Connections.

**Unit:- II**

**Tension Members:** Forms of common sections. Permissible Stresses in tension for steel. Strength of a tension member. Design of tension members (flats, angles & Tee Sections only). Tension splice and their design.

**Unit:- III**

**Compression Members:** Design of struts and columns as per IS:800. Effective length, slenderness ratio and permissible stresses, simple and built up sections, concept of lacings in built up columns.

**Unit:- IV**

**Beams:** Design criteria, allowable stresses, Design of laterally restrained beams including simple built-up sections, Checks for web bulking, web crippling and deflection.

**Unit:- V**

**Column Bases:-** Column bases, design of simple column base for axially loaded columns.

**Text Books:-**

1. Ram Chandra, *Design of steel Structures*, Standard Book House, Delhi.
2. Negi L.S., *Design of steel Structures*, Tata Mc. Graw Hill Education Pvt. Ltd., Delhi.

**Reference Books:-**

1. Punmia B.C., *Design of steel Structures*, Laxmi Publication (P) Ltd., Delhi.
2. Ramamarutham S., *Design of steel Structures*, Dhanpat Rai Publishing Co., Delhi.
3. BIS, *IS 800 – 2005 Code of Practice for General Construction in steel*.

## TRANSPORTATION ENGINEERING – II

### Sixth Semester

Course Code: DCE 603

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#### Course

**Contents: Unit:-**

#### I RAILWAYS

**Introduction: Railways** - An important system of communication in India.

**Permanent Way:** Definition of a permanent way; components of a permanent way, sub grade, ballast, sleepers, rails, fixtures and fastenings. Concept of gauge and different gauges prevalent in India. Suitability of these gauges under different conditions.

**Track Materials: (i) RAILS:** Function of rails. Different types of rail sections-double header, bull headed and flat footed their standard length, weights and comparison. Welded rails-appropriate length of welded rails and advantages of welded rails. Creep: Its definition, causes, effects and prevention. Wear of rails: its causes and effects. **(ii) SLEEPERS:** Function of sleepers; Different types of sleepers: wooden, steel, cast iron (pot type), concrete and prestressed concrete, their sizes, shapes, characteristics and spacing. **(iii) BALLAST:** Function, materials used for making ballast stone, brick, slag and cinder, their characteristics. **(iv) FIXTURES AND FASTENINGS:**

- (a)** Connections of rail to rail-Fishplate and fish bolts.
- (b)** Connection of Rail to sleepers: Sketches of connection between flat footed rails with various types sleepers with details of fixtures and fasteners used.

#### Unit:- II

**Geometrics for Broad Gauge:** Typical Cross-sections of single and double broad gauge railway tracks in cutting and embankment. Permanent and temporary land width. Gradients ruling, maximum, minimum for drainage. Gradients in station yards. Curves; Limiting radius of a curve for broad gauge. Transition length to be provided for railway curves as per railway code. Super-elevation-its necessity and limiting value. Definition of equilibrium cant and cant deficiency, widening of gauge on curves.

**Points and Crossings:** Necessity and details of arrangement; sketch of a turnout definition of stock rail, tongue rail, check rail, lead rail, wing rail, point rail, splice rail, stretcher bar, throw of switch, heel of switch, nose of crossing, angle of crossing, overall length of turnout, facing and trailing points, diamond crossing, cross over, triangle.

**Track Laying:** Preparation of sub grade. Collection of materials setting up of material depot and carrying out initial operations such as adzing of sleepers, bending of rails and assembling of crossings. Definitions of base and rail head. Transportation by material trellises, rail carriers and material trains. Method of track laying (parallel, telescopic and American methods). Organization of layout at rail head. Ballasting of the track.

#### Unit:- III

#### BRIDGES

**INTRODUCTION:** Bridge: Its function and component parts, different parts, difference between a bridge and a culvert.

#### CLASSIFICATION OF BRIDGES:

Their structural elements and suitability:

**(i)** According to life: Permanent and temporary. **(ii)** According to road way level: Deck, through and semi-through. **(iii)** According to material: Wooden, steel, RCC, prestressed and masonry. **(iv)** According to structural form:

**(a)** Beam type-RCC, T-Beam, steel girder bridges, plate girder and box girder, trussed bridges and Warren girder bridges. **(b)** Arch type-open spandrel and filled spandrel, barrel and rib type. **(c)** Suspension type-Unstiffened sling type, its description with sketches. **(d)** According to the position of highest flood level: submersible and non submersible. **(8 Lectures)**

#### Unit:- IV

**Piers, abutments and wing walls:** Piers: Definition parts. Types: solid (masonry and RCC); Open cylindrical and abutment piers. Definition of the following terms; height of pier, water way (natural and artificial), afflux and

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clearance. Abutments and wing walls: Definition, types of abutments (straight and tee) abutment with wing walls (straight, splayed, return and curved).

**Bridge Bearings:** Purpose of bearings: Types of bearings: Fixed plate, sliding plate, deep cast base, rocker and roller bearings, their functions with sketches.

**Temporary Bridges:** Necessity, description with sketches of pontoon and boat bridges.

**Unit:- V**

**Air Port:** Basic Element, Runway and Taxi Way. Tunnel: Introduction, Classification and Construction Method.

**Text Books:-**

1. Gupta B.L., *Road, Railway, Bridges, Tunnels & Harbour Dock Engineering*, Standard Publishers Distributors, Delhi.
2. Rangwala S.C., *Highway Engineering*, Charotar Publishing House (P) Ltd., Anand.
3. Ahuja & Birdi, *Road, Railway, Bridges & tunnels Engineering*, Standard Books House, Delhi.
4. Gupta D.V., *Transportation Engineering*, Asian Publishers Muzaffarnagar.

**Reference Books:-**

1. Khana S.K. & Justo, *Highway Engineering*, Nem Chand & Bros., Roorkee.



# ESTIMATION , COSTING AND VALUATION

## Sixth Semester

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**Course Code: DCE 605**

**Course Contents:**

**Unit:-I**

**Buildings**

Introduction to Estimating: Types of estimates, drawings, (to be attached with these estimates. Preparation of rough cost estimates).

Units of measurement, and units of payment of different items of work.

Different methods of taking out quantities: Centre line in-to-in/out-to-out methods.

Preparation of a detailed estimate, complete with detailed reports, specifications, abstract of cost and material statement for a small residential building with a flat roof.

**Unit:- II**

Preparation of a detailed estimate with specification, abstract of cost and material statement for pitched roof with steel truss only.

**Specifications**

Need, general and detailed specifications, method of writing specifications,

Analysis of rates:-(i) Steps in the analysis of rates for any item of work, requirement of material, lab our, sundries T.& P. contractors profit.(ii) Calculation of quantities of materials for: (a) Plain cement concrete of different proportions. (b) Brick masonry in cement and lime mortar. (c) Plastering and pointing with cement mortar in different proportions. (d) White washing.

**Analysis of Rates:-**Analysis of rates of the following item of work when the data regarding lab our, rates of material and rates of lab our is given.

(a) Earth work in excavation and filling with a concept of lead and lift. (b) Cement concrete in foundation. (c) R.C.C. in roof slabs. (d) First class brick masonry in cement mortar. (e) Cement plaster. (f) Cement pointing: Flush, deep pointing.

**Unit:- III**

**Public health:-** Preparation of detailed estimate for laying a water supply line (C.I. Pipe). Preparation of detailed estimate for sanitary and water supply fittings in a domestic building containing one set of toilets and septic tank.

**Unit:- IV**

**Roads:-**Methods for calculating earth work using:- (i) Average depth. (ii) Average cross sectional area. (iii) Graphical method.

Calculations of quantities of materials for roads in plains from given drawings.

Preparation of detailed estimate using the above quantities. Detailed estimate of a single span slab culvert with return wing walls. Calculation of quantities of different items of work for a masonry retaining wall from given drawings.

**Unit:- V**

**Valuation:-**Purpose of valuation, principles of valuation. Definition of terms such as depreciation, sinking fund, salvage and scrap value. Valuation of a building property by replacement cost method and rental return method. Method of calculation of standard rent-Concept of capitalized value and years purchase.

**Text Books:-**

1. Dutta B.N., *Estimating & Costing in Civil Engineering*, UBS Publishers Pvt. Ltd., New Delhi.
2. Gupta D.V., *Estimating, Costing and Valuation*, Asian Publishers Muzaffarnagar.

**Reference Books:-**

1. Birdi G.S., *Estimating, Costing & Valuation*.
  2. Rangwalala S.C., *Estimating, Costing & Valuation*, Charotar Publishing House Pvt. Ltd., Anand.
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**R.C.C. LAB**  
**Sixth Semester**

**Course Code: DCE 651**

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**Preparation of bar bending schedule and to bend the bars accordingly for the following:**

- (i)** Singly reinforced concrete beam
- (ii)** Doubly reinforced concrete beam
- (iii)** Reinforced concrete column
- (iv)** Reinforced concrete slab