## CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

## TEACHING AND EVALUATION SCHEME FOR 5th SEMESTER DIPLOMA IN CIVIL ENGINEERING

| Sl No. | Subject Code | Subject | PERIODS | | | Evaluation Scheme | | | | | |
| | | | L | T | P | SESSIONAL EXAM. | | | END SEM EXAM | PRACTICAL EXAM | TERM WORK |
| | | | | | | TA | CT | TOTAL | | | |
| | | **THEORY** | | | | | | | | | |
| 1 | DCHR5101 | ENVIRONMENTAL STUDIES | 5 | - | - | 10 | 20 | 30 | 70 | - | - |
| 2 | DCSD5102 | STRUCTURAL DESIGN-I | 5 | - | - | 10 | 20 | 30 | 70 | - | - |
| 3 | DCHE5103 | HIGHWAY ENGINEERING | 5 | - | - | 10 | 20 | 30 | 70 | - | - |
| 4 | DCSP5104 | SURVEYING-II | 4 | - | - | 10 | 20 | 30 | 70 | - | - |
| 5 | DCCT5105 | CONCRETE TECHNOLOGY | 4 | - | - | 10 | 20 | 30 | 70 | - | - |
| | | TOTAL | 23 | - | - | 50 | 100 | 150 | 350 | - | - |
| **PRACTICAL / TERM WORK** | | | | | | | | | | | |
| 6 | DCCE5201 | CIVIL ENGG. LAB-II | - | - | 6 | - | - | - | - | 50 | 50 |
| 7 | DCCL5202 | CADD LAB | - | - | 6 | - | - | - | - | 50 | 50 |
| 8 | DCSD5203 | STRUCTURAL DETAILING-I | - | - | 4 | - | - | - | - | - | 50 |
| | | TOTAL | - | - | 16 | - | - | - | - | 100 | 150 |
| | | **GRAND TOTAL** | **23** | **-** | **16** | **50** | **100** | **150** | **350** | **100** | **150** |

Abbreviations: L- Lecture, T- Tutorial,  P- Practical, TA- Teacher's Assessment, CT- Class Test

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50%

Each tutorial class comprises of a group of 20 students

# ENVIRONMENTAL STUDIES
## (Common to all Branches of Engg.)
## DCHR5101

Period/Week: 05                                           Total Marks:   100
Total Periods: 75                                         Theory End Exams: 70; CT (20) +IA (10)

## **Rationale:**

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc.  Therefore, the subject of Environmental Studies to be learnt by every Engineering student in order to take care of the environmental aspect in each and every activity in the best possible manner.

## **OBJECTIVES:**
After completion of study of environmental studies, the student will be able to:

1.  Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2.  Develop awareness towards preservation of environment.

**Unit 1:       The Multidisciplinary nature of environmental studies              (04 periods)**

Definition, scope and importance, Need for public awareness.

**Unit 2:        Natural Resources                                                        (12 periods)**

**Renewable and non renewable resources:**
a)  Natural resources and associated problems.
   - Forest resources:  Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
   - Water resources:  Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
   - Mineral Resources:  Use and exploitation, environmental effects of extracting and using mineral resources.
   - Food Resources:  World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, .
   - Energy Resources:  Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
   - Land Resources:  Land as a resource, land degradation, man induces land slides, soil erosion, and desertification.
b)  Role of individual in conservation of natural resources.
c)  Equitable use of resources for sustainable life styles.

**Unit 3: Systems** **(12 periods)**

- Concept of an eco system.
- Structure and function of an eco system.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco system:
- Forest ecosystem:
- Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).

**Unit 4: Biodiversity and it's Conservation** **(08 periods)**

- Introduction-Definition:  genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity:  consumptive use, productive use, social ethical, aesthetic and optin values.
- Biodiversity at global, national and local level.
- Threats to biodiversity:  Habitats loss, poaching of wild life, man wildlife conflicts.

**Unit 5:  Environmental Pollution.** **(18 periods)**

Definition Causes, effects and control measures of:

a) Air pollution.
b) Water pollution.
c) Soil pollution
d) Marine pollution
e) Noise pollution.
f) Thermal pollution
g) Nuclear hazards.

Solid waste Management:  Causes, effects and control measures of urban and industrial wastes.
Role of an individual in prevention of pollution.
Disaster management:  Floods, earth quake, cyclone and land slides.

**Unit 6: Social issues and the Environment** **(12 periods)**

- Form unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Resettlement and rehabilitation of people; its problems nd concern.
- Environmental ethics: issue and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Air (prevention and control of pollution) Act.
- Water (prevention and control of pollution) Act.
- Public awareness.

**Unit 7: Human population and the environment** (09 periods)

- Population growth and variation among nations.
- Population explosion- family welfare program.
- Environment and human health.
- Human rights.
- Value education
- Role of information technology in environment and human health.

**Recommended Books:**

1. Textbook of Environmental studies, Erach Bharucha, #UGC

2. Fundamental concepts in Environmental Studies, D.D. Mishra, S.Chand & Co-Ltd,

3. Text book of Environmental Studies by K.Raghavan Nambiar, SCITECH Publication  Pvt. Ltd.

4. Environmental Engineering by V.M.Domkundwar- Dhanpat Rai & Co.

5. Environmental Engineering & Safety by B.K.Mohapatra.

# STRUCTURAL DESIGN – I   (DCSD5102)

Period/Week: 05                          Total Marks:   100
Total Periods: 75                        Evaluation Scheme; Theory End Exam: 70+CT(20)+TA(10)

(Use of only IS 456 code is allowed in the written examination)

**Topic wise Distribution of Periods**:

| Sl. No. | Topics | No. of Periods |
|---|---|---|
| 01. | **Working stress method** | 12 |
| 02. | **Limit state method** | 5 |
| 03. | **Analysis and design of singly reinforced sections (LSM)** | 10 |
| 04. | **Analysis and design of doubly reinforced section (LSM)** | 6 |
| 05. | **Shear, Bond and Development Length (LSM)** | 6 |
| 06. | **Analysis and Design of T-Beam (LSM)** | 8 |
| 07. | **Design of Slab and Stair case (LSM)** | 14 |
| 08. | **Design of Axially loaded columns and Footings (LSM)** | 14 |

## OBJECTIVES:

On completion of the subject a student will be able to –

i)      Design of simple R.C. structural elements.

ii)     Draw structural details for construction.

iii)    Design formwork and scaffolding.

## COURSE CONTENTS:

### 1.0 Working stress method (WSM)

1.1 Objectives of design and detailing. State the different methods of design of concrete structures.

1.2 Introduction to reinforced concrete, R.C. sections their behavior, grades of concrete and steel. Permissible stresses, assumption in W.S.M.

1.3 Basic concept of under reinforced, over reinforced and balanced section, flexural design & analysis of singly and doubly reinforced rectangular sections.

### 2.0 Limit state method (LSM)

2.1 Definition, types of limit states, partial safety factors for materials strength, characteristic strength, characteristic load, design load, loading on structure as per I.S. 875

2.2 I.S specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchorage, effective span for beam & slab.

### 3.0 Analysis and design of singly reinforced sections (LSM)

3.1 Limit state of collapse (flexure), Assumptions, Stress-Strain relationship for concrete and steel, neutral axis, stress block diagram and strain diagram for singly reinforced section.

3.2 Concept of under- reinforced, over-reinforced and limiting section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section.

3.3 Numerical problems on determining design constants, moment of resistance and area of steel for rectangular sections.

### 4.0 Analysis and design of doubly reinforced section (LSM)

4.1 General features, necessity of providing doubly reinforced section, reinforcement limitations.

4.2 Analysis of doubly reinforced section, strain diagram, stress diagram, depth of neutral axis, moment of resistance of the rectangular section.

4.3 Numerical problems on finding moment of resistance and design of beam sections.

### 5.0 Shear, Bond and Development Length (LSM)

5.1 Nominal shear stress in R.C. section, design shear strength of concrete, maximum shear stress, design of shear reinforcement, minimum shear reinforcement, forms of shear reinforcement.

5.2 Bond and types of bond, bond stress, check for bond stress, development length in tension and compression, anchorage value for hooks $90^0$ bend and $45^0$ bend standards lapping of bars, check for development length.

5.3 Numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams; Determination of Development length required for tension reinforcement of cantilevers beam and slab, check for development length.

### 6.0 Analysis and Design of T-Beam (LSM)

6.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.

6.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.

6.3 Design of T-beam for moment and shear for neutral axis within or up to flange bottom.

6.4 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination)..

### 7.0 Design of Slab and Stair case (LSM)

7.1 Design of simply supported one-way slabs for flexure check for deflection control and shear.

7.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.

7.3 Design of two-way simply supported slabs for flexure with corner free to lift.

7.4 Design of dog-legged staircase and cantilever staircase.

7.5 Simple numerical problems on design of one-way simply supported slabs cantilever slab, two-way simply supported slab, dog-legged staircase and cantilever staircase.

**8.0 Design of Axially loaded columns and Footings (LSM)**

8.1 Assumptions in limit state of collapse- compression.

8.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.

8.3 Analysis and design of axially loaded short, square, rectangular and circular columns with lateral ties only; check for short column and check for minimum eccentricity may be applied.

8.4 Types of footing, Design of isolated square column footing for flexure and shear, Design of Strip footing for walls.

8.5 Simple numerical problems on axially loaded short columns, isolated footings and wall footings.

*REFERENCE BOOKS:*

1.  *Reinforced Concrete Structures*          *-I.C.Syal &A.K. Goel.*

2.  *Reinforced Concrete Structures*          *- Pillai & Menon.*

3.  *Reinforced Concrete*          *-HJ Saha.*

4.  *Fundamentals of Reinforced Concrete*          *-N.C.Sinha,S.K.Roy.*

5.  *Limit State Method (RCC Design  )*          *- A.K.Jain.*

6.  *IS:456-2000*          *-BIS Publication*

7.  *SP-16*          *-BIS Publication*

8.  IS 4014: Code of practice for steel tubular scaffolding.

9.  IS 14687: Code of practice for design and construction of Form work.

# HIGHWAY ENGINEERING (DCHE5103)

Period/Week: 05                     Total Marks:   100  
Total Periods: 75                  Evaluation Scheme; Theory End Exam: 70+CT(20)+TA(10)

## Topic wise Distribution of Periods:

| Sl. No. | Topics | No. of Periods |
|---|---|---|
| 1. | **Introduction** | **02** |
| 2. | **Road Geometric** | **10** |
| 3. | **Road Materials** | **08** |
| 4. | **Road Pavements** | **10** |
| 5. | **Hill Roads** | **06** |
| 6. | **Road Drainage** | **06** |
| 7. | **Road Maintenance** | **06** |
| 8. | **Construction equipments** | **04** |
| 9. | **Traffic studies** | **04** |
| 10. | **Landscaping and Arboriculture** | **04** |

## COURSE CONTENTS:
### 1.0 Introduction
1.1      Importance of Highway transportation: importance organizations like Indian roads congress, Ministry of Surface Transport, Central Road Research Institute.

1.2      Functions of Indian Roads Congress

1.3      IRC classification of roads

1.4      Organisation of state highway department

### 2.0     Road Geometric :
2.1      Glossary of terms used in geometric and their importance, right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation level, camber and gradient

2.2      Design and average running speed, stopping and passing sight distance

2.3      Necessity of curves, horizontal and vertical curves including transition curves and super elevation, Methods o f providing super – elevation

### 3.0     Road Materials ;
3.1      Difference types of road materials in use : sol, aggregates, binders

3.2      Function of soil as highway subgrade

3.3      California Bearing Ratio : methods of finding CBR valued in the laboratory and at site and their significance

3.4      Testing aggregates : Abrasion test, impact test, crushing strength test, water absorption test & soundness test

3.5      Aggregates : Availability of road aggregates in India, Requirements of road aggregates as per IS specifications

3.6      Binders : common binders : cement, bitumen and Tar, propertied as per IS specifications, penetration and viscosity test of bitumen, procedure and a significance  of cut back bitumen and bituminous emulsion and their uses

**4.0   Road Pavements**

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

4.2   Sub-grade preparation :

Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, borrow pits, making profile of embankment, construction of embankment, compaction, stabilization, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation

4.3   Flexible pavements : necessity of sub base, stabilized sub bade: purpose of stabilization(no designs)

Types of stabilization "

a.   Mechanical stabilization

b.   Lime stabilization

c.   Cement stabilization

d.   Fly ash stabilization

4.4   Base Course :

Preparation of base course

a.   Brick soling

b.   Stone soling

c.   Metalling : Water Bound Macadam and Bituminous Macadam

4.5   Surfacing :

Types of surfacing

a.   Surface dressing

b.   (i)  Premix carpet

       (ii) Semi dense carpet

c.   Bituminous concrete

d.   Grouting

Methods of constructions as per Ministry of Surface Transport, specifications and quality control

4.6   Rigid Pavements :

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

**5.0   Hill Roads :**

5.1   Introduction :

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

5.2   Breast Walls, Retaining walls, different types of bends

**6.0   Road Drainage :**

6.1   Necessity of road drainage work, cross drainage works

6.2   Surface and sub-surface 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

**7.0** **Road Maintenance :**

    7.1    Common types of road failures – their causes and remedies

    7.2    Maintenance of bituminous road such as patch work and resurfacing

    7.3    Maintenance of concrete roads – filling cracks, repairing joints, maintenance of shoulders (berm), maintenance of traffic control devices

**8.0** **Construction equipments :**

Output and use of the following plant and equipment :

    8.1    Hot mixing plant

    8.2    Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, graders, roller dragline

    8.3    Asphalt mixer and tar boilers

    8.4    Road pavers

    8.5    Modern construction equipments for roads.

**9.0** **Traffic studies :**

    9.1    Basic concept of traffic study

    9.2    Traffic safety and traffic control signal

    9.3    Road junctions

    9.4    Traffic island and refuge island; advantages and disadvantages

**10.0** **Landscaping and Arboriculture**

    10.1    Meaning of landscaping and arboriculture

    10.2    Aesthetics in road side development

**RECOMMENDED BOOKS:**

1. A Text Book Of Transportation Engineering    - S.P.Chandola.

2. Highway Engineering    -S.K.Khanna & C.E.G. Justo

3. A course on Highway engineering    - S.P.Bindra.

4. Highway Engineering    - Dr.N.K.Vaswani.

# SURVEYING – II
## (DCSP5104)

Period/Week: 04                     Total Marks:   100
Total Periods: 60                   Evaluation Scheme; Theory End Exam: 70+CT(20)+TA(10)

## TOPIC WISE DISTRIBUTION OF PERIODS

| Sl. No. | Topics | Periods |
|---------|--------|---------|
| 01 | Levelling | 08 |
| 02 | Contouring | 06 |
| 03 | Principles of theodolite surveying | 10 |
| 04 | Theodolite traversing | 10 |
| 05 | Tacheometry | 08 |
| 06 | Curves | 05 |
| 07 | Computation of Volumes | 06 |
| 08 | Modern surveying methods | 07 |

## OBJECTIVES :

On completion of the subject a student will be able to
1. Conduct plane table survey work in the field using horizontal linear measurements.
2. Plot the profile map and contour map from the recorded data
3. Interpret the plotted contour map and compute data from it.
4. Prepare survey map by conducting traverse survey with theodolite
5. Measure height of objects with the help of theodolite
6. Determine horizontal distance by tacheometry
7. Set out circular curve in the field
8. Lay out the construction plan of different types of structures at the site
9. Use modern electronic surveying instruments

## COURSE CONTENTS  :

### 1.0        LEVELLING :

1.1      Purpose of leveling

1.2      Definition of terms used in leveling – concepts of level surface, Horizontal

surface, vertical surface, datum, R. L., B.M.

1.3      Description of essential features  and uses of different types of leveling instruments

1.4     Concepts of line of collimation, axis of bubble tube, axis of telescope, Vertical axis

1.5     Levelling staff – types, features and use

1.6     Temporary adjustments of level, taking reading with level

1.7     Concept of bench mark, BS, IS, FS, CP, HI

1.8     Principles of leveling – Simple leveling, Differential leveling

1.9     Field data entry – level Book – height of collimation method and Rise & Fall method, comparison, Numerical problems on reduction of levels applying both methods, Arithmetic checks

1.10    Different types of leveling, uses and methods – Fly leveling, check leveling, Profile leveling – longitudinal sections and cross-sections

1.11    Plotting of profiles

1.12    Effects of curvature and refraction, numerical problems on application of correction

1.13    Reciprocal leveling – principles, methods, numerical problems, precise leveling

1.14    Difficulties in leveling, errors in leveling and precautions

1.15    Sensitiveness of bubble tube, determination of sensitiveness

1.16    Permanent adjustments of different types of levels.

1.17    Setting grades and stakes, setting out grades of sewers and related problems

## 2.0 CONTOURING :

2.1     Definitions of related terms, concepts of contours, characteristics of contours

2.2     Methods of contouring, plotting contour maps

2.3     Interpretation of contour maps, toposheets.

2.4     Use of contour maps on civil engineering projects – drawing cross-sections from contour maps, locating proposal routes of roads / railway / canal on a contour map, computation of volume of earthwork from contour map for simple structure.

## 3.0 PRINCIPLES OF THEODOLITE SURVEYING :

3.1 Purpose, definition of terms

3.2  Description of features, component parts of a transit theodolite

3.3 Fundamental axes of a theodolite, concept of vernier, reading a vernier

3.4 Temporary adjustment of theodolite

3.5 Concept of transiting – swinging, faceleft, face right, changing face

3.6 Measurement of horizontal angles with theodolite by repetition and reiteration method

3.7 Measurement of vertical angles with theodolite

3.8 Determination of magnetic bearings with theodolite

3.9 Measurement of deflection angle, direct angle, setting out angles, prolonging a straight line with theodolite

3.10 Errors in Theodolite observations

## 4.0 THEODOLITE TRANSVERSING :

4.1 Methods of traversing with theodolite – inclined angle method, deflection angle method, bearing method

4.2 Plotting the traverse by coordinate method

4.3 Checks for open and closed traverse

4.4 Traverse computation – consecutive coordinates, latitude and departure, Gale's traverse table, Numerical problems on omitted measurement of lengths & bearings

4.5 Closing error – adjustment of angular errors, adjustment of bearings, numerical problems

4.6 Balancing of traverse – Bowditch's method, transit method, graphical method, axis method

4.7 Calculation of area of closed traverse

## 5.0 TACHEOMETRY (Only concepts; applications without derivation)

5.1 Principles, stadia constants determination

5.2 Stadia tacheometry with staff held vertical and with line of collimation horizontal or inclined, numerical problems

5.3 Elevations and distances of staff stations – numerical problems

## 6.0 CURVES :

6.1 compound, reverse and transition curve, Purpose & use of different types of curves in field

6.2 Elements of circular curves, numerical problems

6.3 Preparation of curve table for setting out

6.4 Setting out of circular curve by chain and tape and by instrument angular methods (i) offsets from long chord, (ii) successive bisection of arc, (iii) offsets from tangents, (iv) offsets from chord produced, (v) Rankine's method of tangent angles

6.5 Obstacles in curve ranging – point of intersection inaccessible

## 7.0 COMPUTATION OF VOLUME :

7.1 Methods of computations, formula for different types of cross sections

7.2 Calculation of volumes by prismoidal formula and trapezoidal formula, Prismoidal corrections, curvature correction for volumes.

7.3 Measurement of volumes from spot levels, Contours and calculation of reservoir capacities.

7.4 Mass haul diagram, construction & characteristics, use of mass diagram.

## 8.0 MODERN SURVEYING METHDS :

8.1 Principles, features and use of (i) Micro-optic theodolite, digital theodolite,

8.2 Working principles of a Total Station (Set up and use of total station to measure angles, distances of points under survey from total station and the co-ordinates (X,Y & Z or northing, easting, and elevation) of surveyed points relative to Total Station position using trigonometry and triangulation.

## REFERENCE BOOKS :

1. Plane Surveying –                 Alak. De

2. Surveying Vol. I, II, III –       B. C. Punmia; Laxmi Publication, Delhi – 06

3. A text book of surveying and leveling – R.. Agor; Khanna Publishers, Delhi-6

4. Surveying and Levelling –Hussain and Nagraj; S. Chand & Co., Delhi

5. Surveying and Levelling –N. N. Basak; Tata Mcgrew Hill

# CONCRETE TECHNOLOGY (DCCT5105)

Period/Week: 04           Total Marks: 100
Total Periods: 60           Evaluation Scheme; Theory End Exam: 70+CT(20)+TA(10)

## TOPIC WISE DISTRIBUTION OF PERIODS:

| Sl. No. | Topics | Lecturer in periods |
|---------|--------|---------------------|
| 1. | Concrete as a construction material: | 2 |
| 2. | Cement: | 5 |
| 3. | Aggregate: | 6 |
| 4. | Water: | 2 |
| 5. | Admixtures: | 4 |
| 6. | Properties of fresh concrete: | 4 |
| 7. | Properties of hardened concrete: | 8 |
| 8. | Concrete mix Design | 6 |
| 9. | Production of concrete: | 4 |
| 10. | Inspection and Quality Control of Concrete | 5 |
| 11. | Special concrete | 5 |
| 12. | Deterioration of concrete and its prevention | 4 |
| 13. | Repair technology for concrete structures. | 5 |

## OBJECTIVE:
After completion of study of the students will be able to:-
   i) Explain the properties of cement concrete.
   ii) State the quality control measures to be undertaken.
   iii) Inspect and undertake the testing of cement concrete.

## COURSE CONTENTS:
### 1.0 Concrete as a construction material:
     1.1 Grades of concrete.
     1.2 Advantages and disadvantages of concrete.
### 2.0 Cement:
2.1 Composition, hydration of cement, water cement ratio and compressive strength, fineness of cement, setting time, soundness, types of cement.
### 3.0 Aggregate:
3.1 Classification and characteristics of aggregate, deleterious substances in aggregates, fineness modulus, grading of aggregate,I.S.383
### 4.0 Water:
4.1 Quality of water for mixing and curing.
### 5.0 Admixtures:
5.1 Important functions, classification of admixtures, I.S 9103, accelerating admixtures, retarding admixtures, water reducing admixtures, air containing admixtures.
### 6.0 Properties of fresh concrete:
Concept of fresh concrete, workability, slump test, compacting factor test, V-bee consistency test and flow test, requirement of workability,I.S.1199.

**7.0 Properties of hardened concrete:**

7.1 Cube and cylinder compressive strengths, flexural strength of concrete, stress-strain and elasticity, phenomena of creep and shrinkage, permeability, durability of concrete, sulphate, chloride and acid attack on concrete, efflorescence.

**8.0 Concrete mix Design**

8.1 a) Introduction

b) Data or input required for mix design.

c) Nominal mix concrete &design mix concrete.

d) Basic consideration for concrete mix design, Methods of proportioning concrete mix – I.S Code method of mix design(I.S.10262)

**9.0 Production of concrete:**

9.1 Batching of materials, mixing of concrete materials, transportation, placing of concrete, compaction of concrete, compaction methods, vibrators, curing ,when to start and time of curing ,formwork-requirements and types ,stripping of forms.

**10.0 Inspection and Quality Control of Concrete**

10.1 Quality control of Concrete as per I.S.456, Factors causing the variations in the quality of concrete, field quality control, Sampling &acceptance criteria as per Clause15&16 of IS:456.

10.2 Mixing, Transporting, Placing &curing requirements of Concrete as per I.S.456.

10.3 Inspection and Testing as per Clause 17 of IS:456.

**10.4** Durability requirements of Concrete as per I.S:456.

**11.0 Special Concrete**

11.1 Introduction to ready mix concrete, high performance concrete, silica fume concrete, , shot-crete concrete or gunitting

**12.0 Deterioration of concrete and its prevention:**

12.1 Types of deterioration, prevention of concrete deterioration, corrosion of reinforcement, effects and prevention.

**13.0 Repair technology for concrete structures:**

13.1 Symptom, cause and prevention and remedy of defects during construction, cracking of concrete due to different reasons. repair of cracks for different purposes, selection of techniques, polymer based repairs, common types of repairs.

**RECOMMENDED BOOKS:**

1. Concrete technology- M.L.Gambhir;Tata McGraw Hill.

2. Concrete technology- M.S Shetty, S.Chand &Company Limited,New Delhi.

3. Concrete technology- A.M.Neville;ELBS.

4. Concrete Mix design- Krishna Raju.

5. Concrete technology- A.M.Neville&J.J.Brook

6. Concrete technology- A R Santhakumar.

7. BIS Codes:- I.S 383,10262,9103

# CIVIL ENGINEERING LABORATORY-II   (DCCE5201)

Period/Week: 06                                        Total Marks:   100
Total Periods: 90                                     Evaluation Scheme; Practical Exam: 50+TW(50)

**1.0  TESTS ON SOIL :**   (at least 9 experiments to be conducted)
   1.1      Determination of Specific gravity of Soil by Pycnometer/Density bottle.
   1.2      Determination of Field Density of Soil by Core Cutter Method.
   1.3    Determination of Particle Size gradation of sand/Gravel by sieve analysis.
   1.4    Wet mechanical analysis using pippette method for clay and silt.
   1.5      Determination of Liquid Limit by soil by Casagrande"s apparatus.
   1.6      Determination of Plastic limit of soil.
   1.7      Determination of Shrinkage limit of soil.
   1.8      Determination of Coefficient of permeability of course grained soils under constant head method.
   1.9      Determination of MDD & OMC of soil by using modified Proctor Test.
   1.10     Determination of  C and $\Phi$  of Soil sample by Triaxial Test device.
   1.11     Determination of Coefficient of Consolidation of soil with Consolidation apparatus.
   1.12     Determination of CBR value using Laboratory CBR Testing device.
   1.13     Determination of Swelling Index, Swelling factor & Swelling pressure of expansion.

**2.0 TRANSPORTATION LABORATORY:** (at least 05 experiments to be conducted)
   2.1      Penetration Test of Bitumen.
   2.2      Ductility Test of Bitumen.
   2.3      Viscosity Test of Bitumen.
   2.4      Flash point & Fire Point Test of Bitumen.
   2.5      Softening point Test of Bitumen.
   2.6      Determination of Bitumen content by centrifuge extractor.
   2.7      Determination of striping value of road aggregates .

**3.0 PUBLIC HEALTH ENGINEERING LABORATORY:**
           (at least 06 experiments to be conducted)
   3.1      Determination of Turbidity of water Sample using Turbidimeter/Nephlometer/Jackson's Candle Turbidimeter.
   3.2      Determination of pH of Water sample using (a) pH – meter (b) colour Comparator.
   3.3      Determination of sulphate content of  Water sample.
   3.4      Determination of Acidity/ Alkalinity of Water sample using method of titration.
   3.5      Determination of Iron content of Water sample using colorimetric method using Nesslers' tube.
   3.6      Determination of Cloride content of a Water sample using method of titration.
   3.7      Determination of Bacteriological quality of water sample by Coliform Test.
   3.8      Determination of Coagulant (Alum) dose requirement for a turbid water sample by Jar Test.
   3.9      Determination of dissolved Oxygen of water sample collected from the field using Winkler's method.

3.10    Determination of total solids, suspended solids and dissolved solids of waste water sample by Gravimetric method.

3.11    Determination of Biochemical Oxygen demand (BOD) of waste water sample collected from the field.

3.12    Determination of residual chlorine in a water sample.

**Reference Books:**

1. Concrete Laboratory Manual                                    -Gambhir. Danpat Rai&Sons.

2. Cement,Aggregate and concrete Laboratory Manual     -Dr. M.Chakraborty

3. Highway material testing Laboratory manual              -S.K.Khanna &C.E.G.Justo.

4. Laboratory manual in Highway material testing           -Ajay K. Duggal,Vijaya p.

5. Laboratory work in Hydraulic Engineering                 -G.L.Asawa.

6. Experimental Hydraulics                                           -S.N. Ghosh & S.C Talapatra.

7. Laboratory manual in Environmental Engineering        -Prof.P.D.Kulkarni.

8.0 Civil Engineering laboratory Practice-II                    - Dr. M.R. Samal

**<u>COMPUTER AIDED DESIGN AND DRAFTING LABORATORY</u>  (DCCL5202)**

Period/Week: 06                                              Total Marks:   100
Total Periods: 90                                        Evaluation Scheme; Practical Exam: 50+TW(50)


**1.0  <u>Revit Architecture Software:</u>                                           <u>60</u>**
     1.1  Basics- Modify, Wall, Door, Window, Component, Room, Roof, Floor, Grid, Lines, Dimension, Section, Level, Text, View
     1.2  Modelling- Ramp, Railing, Stair
     1.3  Site- Topo surface- Parking Component, Site Component,
     1.4  Align, Split, Trim, offset, Match type, Line work, Paint
     1.5  Scale, Unit
     1.6  3D View
     1.7  Preparation of approval drawing of a double storied residential building from given specifications with its 3D view using above commands


**2.0  <u>Introduction to STADD Pro Software:</u>                                  <u>30</u>**
     1.1  2-D Modelling of structures, Use of Structure wizard, Geometry, Property, Support, Loads and combinations,Analysis
     1.2  Analysis of a Continuous beam with more than two span subjected to udl and point load


**<u>Softwares Required</u>:**

1)  AutoCAD Revit Architecture Suite (latest Version)        -15 user license

2)  STADD-Pro/V8i (latest Version)                          -15 user license

3)  AutoCAD (Architecture) 2010    (Book)                   -William G. Wyatt

# Structural Detailing-I
## (DCSD5203)

Period/Week:  04                                    Total Marks:   50
Total Periods: 60                                  Evaluation Scheme; Term Work (50)

1.0   Draw the following with necessity details and schedule of bars from supplied hand sketches or given references such as SP 34

(a) Slab, beam and lintel with chaja as in a simple building (Help from Sections 8&9 of SP 34 may be taken ) Plate I

(b) Columns, column-beam connections with  & without splicing, isolated footing, staircase (Help from sections 6, 7, 10 of SP 34 may be taken)
Plate 2

(c) Cantilever and a Counter fort retaining walls : deflected shapes of sections at different locations and details of reinforcement (Help from Section 11 and sheet 20 of SP 34 may be taken ) – Plate 3

**REFERENCE BOOKS:**
1.  IS:456-2000

2.  SP-16                                        -BIS Publication

3.  SP-34                                        -BIS Publication

4.  IS: 13920                                    -BIS Publications.