

Bhavnagar University  
B.E. Semester VII (Civil)  
C-701: Design of Concrete Structure

| Teaching Scheme             |           |           | Examination Scheme |      |                          |               | Total Marks |
|-----------------------------|-----------|-----------|--------------------|------|--------------------------|---------------|-------------|
| Hours per week              |           |           | Theory             |      | Pract/<br>Oral<br>/Marks | T.W.<br>Marks |             |
| Theory<br>Lectures<br>Hours | Tut Hours | Practical | Marks              | Hrs. |                          |               |             |
| 03                          | --        | 02        | 100                | 03   | 50                       | 25            | 175         |

A) Theory:

1. Loads:

Loading standard as per I.S. distribution of loads, computation of wind loads and earthquake forces, combination of loads.

2 R.C.C.:

1. Various structural systems for building design.
2. Continuous beam, typical floor design including design two way continuous slabs, flat slabs, T-beam floor.
3. Columns: Slender columns with uneasily and biaxial bending.
4. Footings: combined footings and raft footings.
5. Structures: canopy, portals, building, under ground and elevated rectangular and circular water tanks.

3. Prestressed Concrete:

Design of sections for flexure, elastic and limit state design in flexure, shear, Torsion, deflection and bearing stresses, Design of simply supported girders of rectangular, T and I sections, Design of end blocks concordant profile, circular water tank design, resistance of FIRE and corrosion.:

4. Structural Detailing

B). Term Work:

Term work shall consist of not less than 4 designs suitability selected from topics of the course under “Design of reinforced concrete and prestressed concrete structures” designs shall be incorporated in a report which shall consist of all full analytical treatment, design procedure, references & all necessary drawings in the form of neat dimensioned sketches, In addition, two detailed working drawings shall be prepared on full imperial size drawing sheet.

C) Practical shall consist of oral and sketching based on the topics given under subject

D). Reference Book:

1. Limit state theory & Design of Reinforced concrete- By Shah & Crave.
2. Design of Multi – storied Building (G + 3) - By Shah & Crave.
3. R.C.C. Design- By Dr.S.N.Sinha.
4. Design of Concretes Structures – By Dayatnam.
5. Advanced Design of concrete structures-By Krishnaraju.
6. Prestressed concrete design – by Krishnaraju.
7. Prestressed concrete design – by Pandit & Gupta
8. Code of practice for plain and reinforced concrete (III revision) (with amendment-I) - IS; 456.
9. Code of Practice for structural safety of Building Loading Standards (revised) (with amendment-I) - IS; 875
10. Criteria for earthquake resistant design of structures (III revision)-IS: 1893
11. Code of practice of water retaining structures- IS: 3370
12. Code of practice for prestressed concrete- IS: 1343:1980
13. Design aids for reinforced concrete- IS: 456, SP-10.
14. Reinforcement Detailing –SP-34.
15. Hand book of concrete Engineering- Macro Fantel.

Bhavnagar University  
B.E. Semester VII (Civil)  
C-702: Foundation Engineering

| Teaching Scheme       |           |           | Examination Scheme |      |                          |               | Total Marks |
|-----------------------|-----------|-----------|--------------------|------|--------------------------|---------------|-------------|
| Hours per week        |           |           | Theory             |      | Pract/<br>Oral<br>/Marks | T.W.<br>Marks |             |
| Theory Lectures Hours | Tut Hours | Practical | Marks              | Hrs. |                          |               |             |
| 03                    | --        | 02        | 100                | 03   | 50                       | 25            | 175         |

[ A ] **THEORY :**

- SOIL EXPLORATION:** OPEN PITS WITH SAMPLING, METHODS OF BORING, SOIL SAMPLING AND SAMPLING TOOLS, STANDARD PENETRATION TEST, DYNAMIC CONEPENETRATION TEST, STATIC CONCE PANETRATION TEST, PLATE LOAD TEST, FIELD VANE SHEAR TEST, FIELD PERMEABILITY TEST, GEOPHYSICAL METHDOS.
- STRESS DISTRIBUTION:** PRESSURE DISTRIBUTION DIAGRAMS, BOUSSINESQ EQUATION, NEWMARK'S INFLUENCE CHART, SESTERGARD'S ANALYSIS, CONTACT PRESSURE.
- FOUNDATION:** TYPES OF FOUNDATION, SELECTION OF TYPE OF FOUNDATION, BASIC REQUIREMENTS OF A FOUNDATION, LOADS ON FOUNDATION.
- SOIL BEARING CAPACITY OF SOILS:** INTRODUCTION, DESIGN CRITERIA, GENERAL, LOCAL AND PUNCHING SHEAR FAILURES, BEARING CAPACITY DETERMINATION BY THEORY ( PRANDTL, TERZAGHI, RANKINE ), BY USE OF PENETRATION TEST DATA AND BY LOAD ATESTS, BEARING CAPACITY FOR INDIVIDUAL AND MAT ( RAFT) FOOTINGS, FILED TESTS-STANDARD PENETRATION TEST AND PLATE LOAD TEST ( ON SINGLE PLATE ), CODRRECTIONS TO SPT VALUES, EFFECT OF WATER TABLE, FOUNDATION SETTLEMENT IMMEDIATE AND CONSOLIDATION, ALLOWABLE BEARING PRESSURE FROM SHEAR AND SETTLEMENT CIRTERIA.
- PILE FOUNDATIONS :** INTRODUCTION, TYPES OF PILES ACCORDING TO THEIR COMPOSITION, THEIR METHOD OF INSTALLATION AND THEIR LOAD CARRYING CHARACTERISTICS, PILES SUBJECTED TO VERTICAL LOADS- PILE BEARING CAPACITY FROM THEORY, FROM DYNAMIC PILE DRIVING FORMULAE ( ENR AND HILEY ), FROM PENETRATION TEST DATA, PILE LOAD TEST, PILE GROUP EFFICIENCY OF PILE GROUPS IN COHESIVE SOILS.
- FOUNDATIONS IN EXPANSIVE SOILS: IDENTIFICATION OF EXPANSIVE SOILS, SWELL POTENTIAL AND SWELLING PRESSURE, METHODS OF FOUNDATION IN EXPANSIVE SOILS, UNDERREAMED PILE FOUNDATION.

[ B ] TERM WORK :

TERM WORK SHALL CONSIST OF LABORATORY WORK AND TUTORIALS ( MIN.30 PROBLEMS ) BASED ON ABOVE COURSE.

[ C ] PRACTICAL :

PRACTICAL EXAMINATION SHALL CONSIST OF ORAL BASED ON TERM WORK

[ D ] **REFERENCE BOOKS :**

- FOUNDATION ENGINEERING -PECK, HANSON & THRONBURN
- FOUNDATION ENGINEERING -BY G,N, SMITH
- PRINCIPLES OF FOUNDATION ENGINEERING -BY BRIJ DAS
- HAND BOOK ON FOUNDATION ENGINEERING -BY FANG AND OTHERS
- SOIL MECH. & FOUNDATION ENGINEERING -BY MURTHY V.N.S.
- MODERN GEOTECHNICAL ENGINEERING -BY ATAMSING
- ANALYSIS AND DESIGN OF FOUNDATION -BY J.BOWLES

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Bhavnagar University  
B.E. Semester VII (Civil)  
C-703: Professional Practice and Valuation

| Teaching Scheme       |           |           | Examination Scheme |      |                          |               | Total Marks |
|-----------------------|-----------|-----------|--------------------|------|--------------------------|---------------|-------------|
| Hours per week        |           |           | Theory             |      | Pract/<br>Oral<br>/Marks | T.W.<br>Marks |             |
| Theory Lectures Hours | Tut Hours | Practical | Marks              | Hrs. |                          |               |             |
| 03                    | --        | 04        | 100                | 04   | 50                       | 25            | 175         |

1. Introduction:

Scope, necessity, use and applications of the subject.

2. Estimating:

Units of measurement and items of work, Methods of measurements and taking our quantities; accuracy and tolerances; abstracting and billing; provision of spot items, provisional sums, prime costs, provisional quantities, contingencies, work charge establishment etc./ in estimates; Unit cost.

3. Estimates:

Necessity and types; Approximate and detailed estimates methods and uses.

4. Rate Analysis:

Necessity, importance, use; rates of labor, materials and items of work; Prerequisites; Factor affecting rate analysis; procedure for rate analysis; Test work; Rate analysis of typical items, schedule of rates, revision of rates.

5. Specifications:

Importance; Requisites of good specification; classification of specifications; Principles of specification writing; drafting of specification; specification of typical items of materials and workmanship; standard specifications.

6. Conditions of contract:

Importance; Requisites of conditions of contract; subject matter of conditions of contract; typical clauses of conditions of contract.

7. Tenders:

Meaning, Types, contents of tender; procedure for inviting tenders; scrutiny and acceptance of tenders; tender documents; unbalanced tender.

8. Contracts:

Meaning and importance; Legal aspects of contract; Types of contracts and their suitability; contract documents; Termination of contracts; contractual disputes and arbitration; standing contracts.

9. Works and stores accounting:

Types of worked administrative approval and technical sanction; recording billing and payment for works and stores; measurement books;; master and daily report; day work; advances; Impress; Indents and material schedules; Material – at -site account; suspense account; tools and plants types, issues, accounting, stores types, stock limits, purchases, issues, issue rates, recumbent, empties, accounting; cash and cash accounting; Inventory; Elements of budget and budgeting.

10. Valuation:

Importance of valuation and its engineering applications; cost, price and value; Nature and forms of value ; property and its types, factors affecting valuation of properties, life of property; residual values of property; capitalized value and years purchase; sinking flood; depreciation, obsolescence and depletion; amortization; annuity; mortgagee; accommodation land and accommodation works, Basements;; Process and methods of valuation; valuation of land; with buildings; valuation for rating and tax purposes; standard tent and its fixating; ratable value; valuation report, valuation rambles. Land acquisition and procedure.

Term work/Practical/Oral shall be based on course under professional practice.

- Books:
1. Estimating & Costing and Valuation –B.N.Datta,
  2. Estimating & Costing and Valuation-Rangwala
  3. Estimating & Costing and Valuation –Chakroborthy
  4. Estimating & Costing and Valuation –Amardeep Agrawal

Bhavnagar University  
B.E. Semester VII (Civil)  
C-704: Harbour and Airport Engineering

| Teaching Scheme       |           |           | Examination Scheme |      |                          |               | Total Marks |
|-----------------------|-----------|-----------|--------------------|------|--------------------------|---------------|-------------|
| Hours per week        |           |           | Theory             |      | Pract/<br>Oral<br>/Marks | T.W.<br>Marks |             |
| Theory Lectures Hours | Tut Hours | Practical | Marks              | Hrs. |                          |               |             |
| 04                    | --        | --        | 100                | 03   | --                       | --            | 100         |

(A) Harbour Engineering:

1. General:

Necessity, History and development; Harbor and port; classification of harbors; Major ports in India; Administrative set up; Harbor economics.

2. Harbour planning:

Classification of harbor ; Harbour components; ship characteristics; characteristics of good Harbour ; principles of harbors planning; size of Harbour ; site selecting , layout of Harbour; Entrance channel.

3. Natural phenomena:

Wind, waves, tides and currents phenomena; their generation, character and effects on marine structures; silting, erasing and littoral drift.

4. Waterfront and ancillary structures:

General design aspects; Breakwaters – function, types & suitability, general principles of design and construction, wharves, quays, jetties, piers, spearheads, dolphins, fenders mooring accessories – function, types & suitability, design & construction features.

5. Dock and locks:

Tidal basin; wet docks – purpose, design consideration, operation, layout locks, lock gates and passage; Repair docks – gowning docks, fleeting docks, slipway.

6. Port facilities:

Ferry transfer bridges; Floating landing stages; a Transit sheds; ware house; uayside lighting & communication in dockyard cold storage; aprons; cargo handling facilities & equipments, passenger terminal facilities.

7. Navigation Aids:

Approach cannel and entrance demarcation; Buoys, bacons, light houses, electronic communication devices.

8. Harbour Maintenance:

General, Drudging of silt material, Disposal of dredged Material, Types of dredging devices, dipper dredge, grapple dredge, continuous bucket elevator or ladder dredge, Hydraulic or suction

(B). Airport Engineering:

1. General:

History and development of air transport, aircrafts, Air transport authorities; Air transport activities; Aircrafts, it characteristics; Airport classifications.

2. Airport Planning:

Regional planning, concepts and advantages, air – port message location and planning of airport elements – airfield, terminated, obstructions, Imaginary surfaces, approach & turning, laws; airport capacity; airport size and site selection, future air traffic; development of new airport, requirmental on ideal airport; airport elements and typical airport layouts.

3. Runway Design:

Wind rose diagrams; Orientation of runway preferential runway; crosswind component and wind coverage; factors affecting runway length ; basic runway corrections to runway length; Runway geometries; runway patterns / configurations.

4. Taxiway Design:

Controlling factors; Taxiway geometrics, elements, layout; Exit taxiway. Location and geometrics; separation clearance; Holding apron; Turnaround.

5. Terminal Area Drainage:

Terminal area elements and requirements; Terminal building functions. Space requirements, location. Planning concepts, vehicular parking and circulation network; aprons location, size, gate position, aircraft parking configuration; full storage area; Hangers; Blast and erosion control.

6 Grading and Drainage:

Airport grading – impotence, operations, earthwork computations; airport drainage – aims, functions, special characteristics, basic requirements, surface and subsurface drainage systems.

7 Air traffic control and visual aids:

Air traffic control – objectives, control system, control network; visual aids – landing information, airport markings, airport lighting; navigational aids; Landing system.

8. Heliports:

Helicopter characteristics; Heliport planning – site selection, helipad geometry and orientation, terminal area; Heliport markings and lighting; vertical take off systems.

Books: 1.Harbour Engineering-S.P.Bindra

2. Harbour and Tunnal Engineering- S.C.Rangwala

3. Airport Engineering-S.C.Rangwala

4. Airport Engineering-Khanna & Arora

Bhavnagar University  
B.E. Semester VII (Civil)  
C-705: Advanced Methods of Structural Analysis (Elective Paper-I)

| Teaching Scheme       |           |           | Examination Scheme |      |                          |               | Total Marks |
|-----------------------|-----------|-----------|--------------------|------|--------------------------|---------------|-------------|
| Hours per week        |           |           | Theory             |      | Pract/<br>Oral<br>/Marks | T.W.<br>Marks |             |
| Theory Lectures Hours | Tut Hours | Practical | Marks              | Hrs. |                          |               |             |
| 03                    | --        | 02        | 100                | 04   | 50                       | 25            | 175         |

A) Theory:

1. Matrix Structural Analysis:

Principles of matrix structural analysis – static and kinematic indeterminacies, stable & structures. Analysis of beams & trusses by stiffness member approach under loading, restrain temperature & support settlement.

Analysis of frames, bents & grid by flexibility system approach

2. Elastic Stability:

Critical load on beam columns, simple cases various formula for column design, Numerical methods, force due to earthquake as per IS code Provisions.

3. Computer Applications:

Functional organization of computer systems, micro computer, terminal operation, different modes of editing interactive processing.

4. Elements of FORTRAN – 77:

Logical operations, transfer control statements, Do LOOPS & Structural programming, sequential & direct access file manipulation commands, subscripted variables & implied looping. Structural engineering applications, Introduction to PC Software's, computer graphics, computer aided drafting. Use of Auto Cad commands such as draw, edit, display & setting utility, 2D and 3D drawings.

B) Term Work:

Term Work shall consist of solution of min.25 Problems & computer programs based on above course.

C) Practical / Oral: Practical examination shall consist of oral based on above course.

D) Reference Books:

1. Matrix Analysis of Framed Structures- By Gere & Weaver
2. Fortran – 77 – By Ramkumar
3. Programming with FORTRAN – By Lipschutz & Poe.
4. Computer Programming & Engineering Analysis. - By Syal & Gupta.
5. Design of Elastic Stability – By Neithercoat

Bhavnagar University  
B.E. Semester VII (Civil)  
C- 705: Geotechnical Engineering – I (Elective Paper-I)

| Teaching Scheme       |           |           | Examination Scheme |      |                          |               | Total Marks |
|-----------------------|-----------|-----------|--------------------|------|--------------------------|---------------|-------------|
| Hours per week        |           |           | Theory             |      | Pract/<br>Oral<br>/Marks | T.W.<br>Marks |             |
| Theory Lectures Hours | Tut Hours | Practical | Marks              | Hrs. |                          |               |             |
| 03                    | --        | 02        | 100                | 04   | 50                       | 25            | 175         |

A) Theory:

1. Consolidation & Settlement Analysis:

Solution of Terzaghi's one dimensional consolidation theory, three dimensional consolidation, sand drains, determination of maximum pore pressure by various methods, time settlement calculations for secondary compression.

2. Shear Strength:

Review of conventional shear tests, triaxial test, shear strength of saturated cohesive soil under different drainage conditions, and shear strength of granular soils critical void ratio, concept of true friction, liquefaction, Skempton's pore pressure parameters. Horsley's shear strength parameters, stress paths, Lamb's stress paths for different field conditions.

3. Stress Distribution:

Stress caused by loaded of different shapes, comparison, of Boussinesq and Westergaard theories and expressions, newmark's influence chart, validity of elastic theory for soils, contact pressure under rigid and flexible footing, stresses due to trapezoidal loads.

4. Slope Stability Analysis:

Fundamentals of conventional methods. Swedish circle, Bishop, friction circle, Taylor stability numbers, stability charts, effects of seepage and non – homogeneity on the stability of slopes, factors of safety for special cases such as end of construction, rapid ( instantaneous) drawdown, steady seepage, tension cracks, Bishop's modified method.

5. Elements of Rock Mechanics:

Porosity, water absorption capacity, RQD, shear strength determination.

B) Term Work:

Term Work shall consist of laboratory work and tutorials (Minimum .30 Problems) based on above course of study under Geotechnical Engineering –I.

C) Practical / Oral:

Practical examination shall consist of oral based term work.

D) Reference Books:

1. Soil Mechanics-By Alamsing
2. Soil Mechanics and Foundation Engineering –By-Arora
3. Soil Mechanics and Foundation Engineering Vol –I –By-V.N.S.Murthy.
4. Hand book of soil Mech. And Foundation Engineering – By Kaniraj
5. Basic Soil Mechanics- By Witlow.

Bhavnagar University  
B.E. Semester VII (Civil)  
C- 705:Elective Paper-I

**DESIGN OF HYDRAULIC STRUCTURE**

| Teaching Scheme       |           |           | Examination Scheme |      |                    |            | Total Marks |
|-----------------------|-----------|-----------|--------------------|------|--------------------|------------|-------------|
| Hours per week        |           |           | Theory             |      |                    |            |             |
| Theory Lectures Hours | Tut Hours | Practical | Marks              | Hrs. | Pract/ Oral /Marks | T.W. Marks |             |
| 03                    | --        | 02        | 100                | 04   | 50                 | 25         | 175         |

1. Diversion head work; weir, barrage, functions of component parts, head regulator, Its location and, Design of weir/ barrage on impervious floor, (Based on Blight's & Khosla's theories)
2. Irrigation channels – Silt theories, Design of irrigation canal as per Kennedy's and Lacey's silt theory, use of Garret's charts.
3. Canal regulation work: Falls, design, location and different types.
4. Cross drainage works, Categories choice of type hydraulic design considerations.
5. Fluming of canal (Canal transition).
6. Canal outlet functions and types, important definitions, Design consideration for no modular and semi modular pipe butlet.

Term work shall be base on above syllabus

Books: 1.Irrigation & Water Power Engineering-Dr.S.K.Garg  
2.Irrigation & Hydrolic Structure Engineering- Dr.B.C.Punamiya

Bhavnagar University  
B.E. Semester VII (Civil)  
C- 706: Civil Engineering Project-I

| Teaching Scheme       |           |           | Examination Scheme |      |                          |               | Total Marks |
|-----------------------|-----------|-----------|--------------------|------|--------------------------|---------------|-------------|
| Hours per week        |           |           | Theory             |      | Pract/<br>Oral<br>/Marks | T.W.<br>Marks |             |
| Theory Lectures Hours | Tut Hours | Practical | Marks              | Hrs. |                          |               |             |
| --                    | --        | 04        | --                 | --   | 100                      | 50            | 150         |

The civil Engineering Project-I shall comprise of

a) One data-based project

OR

b) One field – based Project

In any one or more the following areas:

- 1) Transportation Engineering,
- 2) Traffic Engineering
- 3) Town planning and Housing
- 4) Bridge Engineering
- 5) Water Resources Engineering
- 6) Environmental Engineering.

Data – Based Project:

Based on the given project data, the detailed designs excluding structural designs shall be done, and suitably presented in the form of report and necessary drawings.

Field – Based Project:

Detailed field survey shall be planned and carried out, the collected field data shall be thoroughly analyzed, and suitably presented in the form of report and necessary drawings, Term work, Practical / Oral and seminar shall be based on the course under “ Civil Engineering Project-I”