**GOA UNIVERSITY**

SCHEME OF INSTRUCTION AND EXAMINATION

REVISED COURSE IN 2008-09

TE (CIVIL) SEM V

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subject  Code | Name of the  Subjects | Scheme of Instructions  Hrs/Week | | | Scheme of Examination | | | | |
| L | T | P | Th. Dur  (Hrs) | Marks | | | |
| Th | S | P | Total |
| 5.1 | Structural Analysis – II | 3 | 1 | 2 | 3 | 100 | 25 | 25 | 150 |
| 5.2 | Geotechnical Engineering – I | 3 | 1 | 2 | 3 | 100 | 25 | 25 | 150 |
| 5.2 | Building Drawing - II | 3 | 1 | 2 | 4 | 100 | 25 | 25 | 150 |
| 5.4 | Design of Concrete Structures | 3 | 1 | - | 3 | 100 | 25 | - | 125 |
| 5.5 | Transportation Engineering - I | 3 | 1 | 2 | 3 | 100 | 25 | 25 | 150 |
| 5.6 | Design of Steel Structures | 3 | 1 | - | 3 | 100 | 25 | - | 125 |
| **TOTAL** | | 18 | 6 | 8 | - | 600 | 150 | 100 | 850 |

NOMENCLATURE :-

L – Lectures

T – Tutorials

P – Practicals

Th – Theory

S – Sessional

O – Oral

1. 12 lectures per module -unless otherwise specified.
2. At least 8experiments to be conducted based on the syllabus unless otherwise specified.

T.E. CIVIL (SEM V)

**CE 5.1 STRUCTURAL ANALYSIS – II**

1. **COURSE OBJECTIVE**: Structural analysis forms the basis for design of any structure. With the prior knowledge of Structural analysis I, this course aims at making the student conversant with the analysis methods of indeterminate structures.

1. **INSTRUCTIONAL OBJECTIVE**: At the end of this course, the student will be able to:
2. Analyze a structure by slope deflection method, Moment distribution method, Rotation contribution, approximate methods and matrix methods of analysis
3. Work with analysis softwares.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Scheme of Instruction** | | | **Scheme of Examination** | | | | |
| **L** | **T** | **P** | **Th. Paper Duration (hrs)** | **Th.** | **Sessional** | **Pract** | **Total** |
| **3** | **1** | **2** | **03** | **100** | **25** | **25** | **150** |

**Module-I**

1. Analysis of Indeterminate Structures: Displacement Methods. Slope defections method Applications to continuous beams, single storey portal frames with sway. Support Settlement.

**Module II**

1. Displacement Methods: Moment distribution method. Applications to continuous beams, single storey portal frames with sway. Support Settlement.

**Module III**

1. Stiffness and flexibility coefficients: Use of stiffness and flexibility coefficients in the formulation of equilibrium and compatibility conditions respectively. Stiffness and flexibility matrices for some simple cases.

**Module IV**

1. Rotation Contribution method: Basic Concepts, Rotation Contribution, Rotation Factor, -Application to Continuous beams, portal frames and Multistoried frames with lateral loads (Wind and Earthquake).

Support Settlement.

1. **TUTORIALS**

Introduction to Structural Analysis Softwares, The tutorials should include analysis of Continuous beams/portal frames/ trusses using softwares.

1. **PRACTICALS**
2. Verification of bending moment variation at the point of loading. Variation of bending moment away from the point of loading/related analytical calculation report..
3. Verifications of beam deflections, general bending formulae and Beam end rotations. - Cantilever, Propped cantilever and simply supported beam.(optionally continuous and indeterminate beam) /related analytical calculation report.
4. Verification unsymmetrical bending and shear centre of different unsymmetrical sections.
5. Study of Bow's Notation, strains, stresses, forces and deflections in various frameworks, including a Warren girder and roof truss/related analytical calculation report.

5. Experiments on verifying charactenstics of a three-pinned arch, relationship between applied loads and horizontal thrust produced from a simple determinate arched structure, /related analytical calculation report.

The practical examination should include experiments and report on tutorial problems with results

1. **TEXT BOOKS:**

1. Analvsis of Structures - Vol. I & 2 bv Bhavikathi. Vikas publications

2. Analysis of structures by Vazrani & Ratwani - Khanna Publications.

3. Strength of Materials and mechanics of solids Vol-2 by B.C. Punmia, Laxmi Publications, New Delhi

**4.** Structural Analysis by C.S. Reddy, Tata Macgrawhill, New Delhi

1. **REFERENCE BOOKS:**

Structural Analysis Raniamurtharn,

Structural Analysis R.S. Khurmi,

Analysis of Statically indeteraunate Structures, Dayaratnam, P.

Wang C.K. "Statically Indeterminate Structures"

Laursen, "Structural Analysis"

Arya and Jain, "Theory and Analysis of Structures"

J.S-Kinney, "Indeterminate Structural Analysis"

K.H.Gerstle, "Analytical Methods in Structural Analysis"

Thandam B.N, "Modem Methods in Structural Mechanics"

Neal B.G., "Plastic Methods of Steel Structures"

Arya and Ajmani, "Design of Steel Structures"

I.S. **456-2000**

l.S. 800-1984

T.E. CIVIL (SEM V)

**CE 5.2 GEOTECHNICAL ENGINEERING -1**

**COURSE OBJECTIVE**: Understanding the mechanics of soil helps to gain an insight about the

physical nature, engineering behavior and response of the soil to applied environmental and loading

factors.

1. **INSTRUCTIONAL OBJECTIVE**: At the end of this course, the student will be able to:

1. Understand the method of soil exploration

**2.** Understand behavior of soil under loads.

3. Assess the capacity of soil to withstand stresses

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Scheme of Instruction** | | | **Scheme of Examination** | | | | |
| **L** | **T** | **P** | **Th. Paper Duration (hrs)** | **Th.** | **Sessional** | **Pract** | **Total** |
| **3** | **1** | **2** | **03** | **100** | **25** | **25** | **150** |

**Module-I**

1. Index Properties: introduction, soil as three phase system, Index Properties -specific gravity, porosity, void ratio, Density, unit weight, moisture content etc. Weight volume relationship. Different forms of soil moistures Atterberg limits.

2 Classification ot soil: Introduction, grain size distribution, Particle size classification, textural classification, .I. S. system of classification for coarse grained and fine grained soils. Field ide ntification of soils, soil structure.

**Module- II**

3. Flow through Soils: Darcy's law, factors affections permeability, Laboratory determination of permeability - falling head and constant head methods, permeability of stratified soil deposit, Laplace equation for seepage, flow net and its application, piping phenomenon.

4. Shear Strength: Concept of shear strength, Total stress and effective stress concept, Principal stresses, Mohr's circle, Mohr, Coulomb, Mohr - Coulomb shear strength theories. Laboratory determination of Shear strength- unconfined compression test. Direct shear test, Vane shear test, triaxiai shear test, application of shear strength parameters in field.

**Module- III**

5. Compaction :Theory of Compaction, Mechanism of Compaction, standard and modified Proctor compaction test, OMC and MDD, Factors influencing compaction, Methods and measurement of field compaction, field compaction control.

6 Compressibility & Consolidation, Compressibility of laterally confined soils, pressure-void ratio curve, compressior, inciex, consolidation process, spring analogy, Terzaghi theory of t-D) consolidation, Laboratory consolidation test. Degree of consolidation, relevance of one dimensional consolidation to field conditions. Time factor.

**Module- IV**

7. Earth Pressure :Concept of earth pressure, relation of deformation and earth pressure, active, passive and at rest conditions, conjugate stresses, Rankine and Coulomb's Earth pressure theories. Graphical solutions-trial wedge method, Culmman method, Rebhan construction and modification. Critical depth of open cut in cohesive soil.

8. Soil Exploration and sampling: General planning, Site exploration, disturbed and undisturbed Soil samples and samplers. Methods of site exploration-SPT, Cone Penetration, wash boring and rotory drilling .

C. **PRACTICALS**

The following Experiments shall be completed.

1. Determination of Specific Gravity (By specific Gravity Bottle)

*I.* Determination oi Moisture content (tsy uven Drying Metnoaj

3. Determination of Atterberg Limit

(a) Liquid Limit

(c) Shrinkage Limit

4. Determination of Grain Size Distribution

(a) Sieve Analysis

*(b)* Sedimentation Analysis / pipette Analysis;

5. Determination of Field Density

(a) Core- Cutter Method

*(p)* Sand Replacement Method

6. Proctor Compaction Test

7. Determination of Shear Strength of Soil

8. Permeability Test

9. Consolidation Test

**E. TEXT BOOKS:**

Puninia B.C- Soil Mechanic & Foundation

Alam Singh - Modern Geotechnical Engineering

Kasmalkar B.J- Geotechnical Engineering

**F. REFERENCE BOOKS:**

Terzaghi K.V- Soil Mechanics

Gulati S.K- Engineering Properties of Soil

K.Purrshotham Raj - Geotechnical Engineering

SKGare- Soil Mechanics and Foundations

V N S Murthy- Geotechnical Engineering

LambeT.W.- Soil Testing - Willey Eastern Limited, New Delhi

Relevant I S Codes- BIS, New Delhi

T.E. CIVIL (SEM V)

**CE 5.3 BUILDING DRAWING - II**

**COURSE OBJECTIVE**: This course helps the students to apply the knowledge of Engineering Drawing and Building Drawing - **1** in the design of different components of public buildings.

1. **INSTRUCTIONAL OBJECTIVE**: At the end of this course, the student will be able to:

1) Plan public buildings^with respect to its category and usage with minimum requirements

(2) Understand the different types of zones in which the public accommodation can be set-up.

(3) Prepare the working drawings of different types of buddings.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Scheme of Instruction** | | | **Scheme of Examination** | | | | |
| **L** | **T** | **P** | **Th. Paper Duration (hrs)** | **Th.** | **Sessional** | **Pract** | **Total** |
| **3** | **1** | **2** | **03** | **100** | **25** | **25** | **150** |

**Module-I**

1. Introduction: Public accommodation systems, general requirements, necessary and minimum requirements of public accommodations. Zoning and design aspects. nvironmental

considerations. PDA regulations with reference to public buildings.

Barrier frees Environment. National Building Code, Fire Safety, Lighting and Ventilation

**Module – II**

2.Design of buildings for education - Schools, colleges, training centers, libraries & hostels.

**Module-III**

3. Design of commercial Buildings- Office buildings, factories, ware house and terminal facilities.

**Module – IV**

4. Design of buildings for recreation and health - Hospitals, Hotels, Theaters, Parks amusement centers, Sports facilities, Rest houses.

**C. PRACTICALS/ TERM WORK:**

Practical work shall include at least one detailed sneet on module ***2, 3,*** and 4. One sheet or perspective drawing on any one module 2,3, or 4. Each sheet shall accompany with a detailed report of area statements and other stipulations specified in PDA rules. Use of Auto CAD in detading any one component from the drawings chosen above.

- One scaled model of a small Bungalow.

**D- TEXT BOOKS:**

Building Drawing by Shah ,Kale and Patki

Building Drawing by Y.S. Sane.

**E. REFERENCE BOOKS:**

Human factors Design Engg. - Woodson, TMGH, NewDelhi

Time Saver Standard Series.

T.E. CIVIL (SEM V)

**CE 5.4 DESIGN OF CONCRETE STRUCTURES**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Scheme of Instruction** | | | **Scheme of Examination** | | | | |
| **L** | **T** | **P** | **Th. Paper Duration (hrs)** | **Th.** | **Sessional** | **Pract** | **Total** |
| **3** | **1** | **-** | **03** | **100** | **25** | **-** | **125** |

1. COURSE OBJECTIVE: With the Prior knowledge of Structural Analysis arid Geotechnical Engineering, this course imparts the knowledge of structural design of a reinforced concrete structure using Working Stress and Limit State method and apply the same for designing the various components of the building and water tanks.

B. INSTRUCTIONAL OBJECTIVE: At the end of this course, the student will be able to:

1. Interpret Codal provisions.

2. Design a RCC slab, beam, column, footings and water Tanks by working slab method.

3. Detail the reinforcement as per the design.

1. **Module No. I**

Introduction to WORKING STRESS method, Fundamentals of R.C sections. Analysis of RC sections, Singh/ Reinforced.

1. **Module No. II**

Design of Rectangular Water Tanks resting on ground, underground and overhead tanks.

Design of Circular Tanks resting on ground.

1. **Module No. III**

Introduction to LIMIT STATE method, Fundamentals of R.C sections. Analysis of RC sections, Singly Reinforced, Doubly Reinforced, and flanged sections. Concept of shear, bond, and torsion.

Codal provisions *Statistical approach*

Design of axially loaded short columns. Design of Isolated column footings subjected to axial

loads.

1. **Module No. IV**

Basic Design of one-way / two-way slabs and beams & detailing.

**C. TUTORIALS**

Design of RCC Slab/Beam/Column/Footing using excel spread sheets

**TEXT BOOKS:**

Reinforced concrete structures - by Sinha, SiCRoy

Reinforced concrete - by B.C.Pumia , A.K.Jain & A.K. Jain

Reinforced concrete structures - by Furgussion Tata Mc Graffiil

Reinforced concrete - by Nilson

**E. REFERENCES:**

All relevant IS codes.

Reinforced Concrete - Mechanics and Design, by James G. MacGregor, Second

Edition, Published by Prentice Hall, Englewood Cliffs, New Jersey 07632,1992.

Building Code Requirements for Reinforced Concrete (ACI 318-95) and Commentary-

ACI318R-95). American Concrete Institute, Detroit, Michigan, 1995.

T.E. CIVIL (SEM V)

**CE 5.1 Transportation**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Scheme of Instruction** | | | **Scheme of Examination** | | | | |
| **L** | **T** | **P** | **Th. Paper Duration (hrs)** | **Th.** | **Sessional** | **Pract** | **Total** |
| **3** | **1** | **2** | **03** | **100** | **25** | **-** | **125** |

COURSE OBJECTIVE: This course gives an insight into the various constructional features highway and Airports It gives an introduction to the various methods at arriving at a highway and airport design.

B. INSTRUCTIONAL OBJECTIVE: At the end of this course, the student will be able to:

a. Familiarize with the latest technologies in the field of highway and airport planning and design.

b. Understand the codal requirements.

**Module-1**

1. Introduction: Definition and Objectives of Transportation, Importance, Different Modes of Transportation, Characteristics of Road Transport, Importance of Road in India, Scope of Highway Engg; Necessity of Highway Planning, Classification of Roads, Road Pattern, typical cross sections of roads in urban and rural area - salient features of first, second and third road development plans in India - The new concepts of Highway Engineering as per Golden Quadrilateral, North South and East West corridors, worked out problems
2. Highway alignment and surveys: Highway Alignment-basic principles, Engineering survey for Highway Locution, Drawing and Report, Highway Project Planning Survey, Plans preparation, Interpretauon of Planning Survey, Planning of Highway Bye passes , Preparation of Master plan & its phasing. IRC specifications
3. Geometric design : introduction, Highway cross section Elements, Sight Distance - pavement surface characteristics - camber and width requirements - sight distances - stopping and overtaking sigAt distances - overtaking zone requirements - design of horizontal alignment - speed - radius - super elevation - methods of providing super elevation - extra widening of pavements - transition curves - design of vertical alignment - gradient - grade compensation - summit curves and valley curves - worked out problems on ah the above topics, Necessity and Design of Service roads for Highways, Dessign of Bus bays.

**Module- II**

4. Highway materials, design, construction and maintenance:

Desirable properties and testing of highway materials - road aggregates, bitununous materials

and subgrade soil factors influencing the design of pavements -CBR method and IRC guidelines for flexible pavements - design of rigid and flexible pavements using IRC charts - worked out problems - consmiction of earth roads - WBM roads - cement stabilized roads – bituminous cement - cement concrete roads and joints in cement concrete roads - brief study of types and uses of failures m flexible and rigid pavements and maintenance- strengthening of existing pavements- Highway Drainage. - Introduction, importance of highway drainage, surface drainage, subsurface drainage, drainage of slopes and erosion control, new methods and concepts in Highway Drainage. Road construction in water logged areas

5. Traffic engineering :Introduction, Traffic Characteristics, Traffic Operation, Design of Intersections, Necessity,Design and Location of speed breakers and subways .Design of Parking facility, Highway Lighting, Traffic Planning and administration. Traffic control devices; Various types of traffic facilities Introduction - road user, vehicle and traffic characteristics - traffic engineering studies - speed - speed and dela> - volume - origin and destination - parking and accident studies - simple worked out problems - principles of design of at grade intersections - simple layouts - objectives, classification and uses of traffic signs and markings - Highway Lighting

**Module- IV**

Airport planning and design:

Introduction - aircraft characteristics and their influence on planning of airports – airport obstructions and zoning - component parts of airport and site selection - runway design - orientation - basic runway length - corrections and geometric design; design of taxiways and aprons - terminal area planning - facilities in terminal area and their planning concepts –aircraft parking configurations - design of drainage system - surface and subsurface drainage systems and their design

**C. PRACT1CALS**

1. Sieve analysis of fine and coarse aggregates

2. Determination of flakiness and elongation Index

3. Determination of Los Angeles Abrasion value.

4. Impact test for Aggregates

5. Crushing test for aggregates

6. Determination of sofiening point of Bitumen

7. Determination of ductinty value

8. Marshal stability test

2- Penetration test for Bitumen

*J.* Specific gravity of Bitumen

11. Determination of Bitumen Content.

12. Job Mix Design.

**D. TEXT BOOKS:**

1. Highway Engineering : Khanna & Justo

**E. REFERENCE BOOKS:**

Highway Engineering : S.P.Bindra

Highway Engineering: G.V.Rao

Principles of Transportation Engineering : Partha Chakroborty, Anhnesh Das?

T.E. CIVIL (SEM V)

**CE 5.6 DESIGN OF STEEL STRUCTURES -1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Scheme of Instruction** | | | **Scheme of Examination** | | | | |
| **L** | **T** | **P** | **Th. Paper Duration (hrs)** | **Th.** | **Sessional** | **Pract** | **Total** |
| **3** | **1** | **2** | **03** | **100** | **25** | **-** | **125** |

COURSE OBJECTIVE: This Course will help the students to analyse and design structural elements in steel. It will also help to analyse the stability of existing steel structures..

B. INSTRUCTIONAL OBJECTIVE: At the end of this course, the student will be able to:

- Design the various suuctural members in steel.

- Familiarize with the latesj development in steel structures

- Use the latest available codes in this subject.

**Module -I**

1. Introduction.

Merits and demerits of steel, Rolled steel sections, loads, permissible stresses, Factor of safety, design methods.

Welded Connections: Introduction, types of welds, types of welded joints, permissible stresses, design of fillet weldsfor axial loads and eccentric loads, unstiffened seat connections, butt welds, design of axiaily and eccentrically loaded butt welds.

2. Bolted Connections: Introduction, Advantages/ Disadvantages, Types of bolts, types of bolted connections, dsign of bolted shear connections, Bolts subjected to tension, bolted connections subjected to combined shear and tension.

**Module –II**

3. Design of Tension members: Introduction, permissible stresses, Net sectional areas, Design of axiaily loaded tension members, design of tension members subjected to both axial tension and bending

**4.** Design of Compression members: Introduction, effective length of columns, Slenderness ratio, design of axiaily loaded compression members, Beam Column, design of eccentrically loaded compression members, column splicing, design of angle struts.

**Module-III**

5. Design of Built-up Compression members with lacings and battens

6. Design of column bases: Introduction, design of slab base, column bases subjected to momentrs

**Module-IV**

7. Design of beams: Introduction, permissible stresses in bending, shear, bearing, deflection, web crippling, web buckling, lateral stability of beams, design of laterally supported beams, elastic critical su ess, design of laterally unsupported beams.

8. Built - up beams. Design of plated built-up beams, check for bending stress, shear stress,

deflection, curtailment of cover plates.

**REFERENCE** BOOKS:

1. Design of steel **structures** by Dr.N.Subramanian

2. Design of steel **structures** by Dr. B **C** Punmia,A.K. jain, A.K. Jain

3. Design of steel suuotures by ST.K. Duggal

4. Design of steel structures by L.S.Negi

5. Design of steel structures by Ramchandra, Vol-l,Vol-JI

6. IS 800-2007-Geiierat construction in steel code of practice

7. **IS** 875-1987

1. Steel tables