

GOA UNIVERSITY

SCHEME OF INSTRUCTION AND EXAMINATION

REVISED COURSE IN 2008-09

TE (CIVIL) SEM V

Sl. No.	Name of the Subjects	Scheme Of Instruction Hrs/Week			Scheme of Examination				
		L	T	P	Th. Dur (Hrs)	Marks			
						Th.	S	P	Total
5.1	Structural Analysis -II	3	1	-	03	100	25	-	125
5.2	Geotechnical Engineering -I	3	1	-	03	100	25	-	125
5.3	Building Drawing -II	3	1	-	04	100	25	-	125
5.4	Design of Concrete Structures	3	1	-	03	100	25	-	125
5.5	Transportation Engineering -I	3	1	-	03	100	25	-	125
5.6	Design of Steel Structures -I	3	1	-	03	100	25	-	125
	Practicals for subject 5.1	-	-	2	-	-	-	25	25
	Practicals for subject 5.2	-	-	2	-	-	-	25	25
	Practicals for subject 5.3	-	-	2	-	-	-	25	25
	Practicals for subject 5.5	-	-	2	-	-	-	25	25
	TOTAL	18	06	08	-	600	150	100	850

NOTATION

L - Lectures
 T - Tutorials
 P - Practicals.
 Th. - Duration of Theory Paper
 Th - Theory
 S - Sessional,
 P - Practical,
 O - Oral.

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

10/1/12
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(CE 5.1) STRUCTURAL ANALYSIS – II

A. **COURSE OBJECTIVES:** 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.

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

1. Analyze a structure by slope deflection method, Moment distribution method, Rotation contribution, approximate methods and matrix methods of analysis
2. Work with analysis softwares.

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L	T	P	Th. Paper Duration (hrs)	Th	Sessional	Practicals	Total	I	12
3	1	2	03	100	25	25	150	II	12
								III	12
								IV	12

Module I

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

Module II

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

Module III

3. 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

4. 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.

C. TUTORIALS

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

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PRACTICALS

- Verification of bending moment variation at the point of loading. Variation of bending moment away from the point of loading/related analytical calculation report..
- 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. .
3. Verification unsymmetrical bending and shear centre of different unsymmetrical sections.
 4. 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 characteristics 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

E. TEXT BOOKS:

1. Analysis of Structures – Vol. I & 2 by 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

F. REFERENCE BOOKS:

Structural Analysis Ramamurtham,
Structural Analysis R.S. Khurmi,
Analysis of Statically Indeterminate 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"
Thandani B.N, "Modern Methods in Structural Mechanics"
Neal B.G., "Plastic Methods of Steel Structures"
Arya and Ajmani, "Design of Steel Structures"
I.S. 456-2000
I.S. 800-1984

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(CE. 5.2) - GEOTECHNICAL ENGINEERING – I

A. **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.

B. **INSTRUCTIONAL OBJECTIVES:** 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 stress

Scheme of Instruction			Scheme of Examination					Module	Contact Hours
L	T	P	Th. Paper Duration (hrs)	Th	Sessional	Practicals	Total	I	12
3	1	2	03	100	25	25	150	II	12
								III	12
								IV	12

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 of soil: Introduction, grain size distribution, Particle size classification, textural classification, .I. S. system of classification for coarse grained and fine grained soils. Field identification of soils. soil structure.

Module- II

3. Flow through Soils: Darcy's law, factors affecting 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, triaxial 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, compression index, consolidation process, spring analogy, Terzaghi theory of 1-D consolidation, Laboratory consolidation test. Degree of consolidation, relevance of one dimensional consolidation to field conditions. Time factor.

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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)
2. Determination of Moisture Content (By Oven Drying Method)
3. Determination of Atterberg Limit
 - (a) Liquid Limit
 - (b) Plastic 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
 - (b) Sand Replacement Method
6. Proctor Compaction Test
7. Determination of Shear Strength of Soil
8. Permeability Test
9. Consolidation Test

E. TEXT BOOKS:

Punmia 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.Purushotham Raj	-	Geotechnical Engineering
S K Garg -		Soil Mechanics and Foundations
V N S Murthy-		Geotechnical Engineering
Lambe T.W.		Soil Testing - Willey Eastern Limited, New Delhi
Relevant I S Codes		BIS, New Delhi

(CE5.3) - BUILDING DRAWING - II

A. COURSE OBJECTIVES: This course helps the students to apply the knowledge of Engineering Drawing and Building Drawing – I in the design of different components of public buildings.

B. INSTRUCTIONAL OBJECTIVES: 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 buildings.

Scheme of Instruction			Scheme of Examination					Module	Contact Hours
L	T	P	Th. Paper Duration (hrs)	Th	Sessional	Practicals	Total	I	12
3	1	2	04	100	25	25	150	II	12
								III	12
								IV	12

Module - I

1. Introduction: Public accommodation systems, general requirements, necessary and minimum requirements of public accommodations. Zoning and design aspects. Environmental considerations. PDA regulations with reference to public buildings.

Barrier free 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 sheet on module 2, 3, and 4. One sheet of 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 detailing 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.

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(CE. 5.4) -DESIGN OF CONCRETE STRUCTURES

A. **COURSE OBJECTIVE:** With the prior knowledge of Structural Analysis and 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.

Scheme of Instruction			Scheme of Examination					Module	contact Hours
L	T	P	Th Duration (hrs)	Paper Th	Sessional	Practicals	Total	I	12
3	1	-	03	100	25	-	125	II	12
								III	12
								IV	12

1. Module No. I

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

2. Module No. II

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

Design of Circular Tanks resting on ground.

3. 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.

4. 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

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TEXT BOOKS:

- Reinforced concrete structures – by Sinha, S.K.Roy
- Reinforced concrete – by B.C.Punia, A.K.Jain & A.K. Jain
- Reinforced concrete structures – by Furgussion Tata Mc Graffill
- 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-ACI 318R-95). American Concrete Institute, Detroit, Michigan, 1995.

(CE 5.5) - TRANSPORTATION ENGINEERING -I

COURSE OBJECTIVE: This course gives an insight into the various constructional features of 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.

Scheme of Instruction			Scheme of Examination					Module	contact Hours
L	T	P	Th. Paper Duration (hrs)	Th	Sessional	Practicals	Total	I	12
3	1	2	03	100	25	-	125	II	12
								III	12
								IV	12

Module- I

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 Location, Drawing and Report, Highway Project Planning Survey, Plans preparation, Interpretation 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 sight 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 all the above topics, Necessity and Design of Service roads for Highways, Design of Bus bays.

Module- II

4. **Highway materials, design, construction and maintenance:**

Desirable properties and testing of highway materials - road aggregates, bituminous 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 - construction of earth roads - WBM roads - cement stabilized roads - bituminous

ements - cement concrete roads and joints in cement concrete roads - brief study of types and uses of failures in 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

Module -III

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 (intersection, urban streets, etc)

Introduction - road user, vehicle and traffic characteristics - traffic engineering studies - speed - speed and delay - 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. PRACTICALS

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 softening point of Bitumen
7. Determination of ductility value
8. Marshal stability test
9. Penetration test for Bitumen
10. 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 , Animesh Das

(CE5.6) - DESIGN OF STEEL STRUCTURES - I

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 OBJECTIVES: At the end of this course, the student will be able to:

- Design the various structural members in steel.
- Familiarize with the latest development in steel structures
- Use the latest available codes in this subject.

Scheme of Instruction			Scheme of Examination					Module	contact Hours
L	T	P	Th. Paper Duration (hrs)	Th	Sessional	Practicals	Total	I	12
3	1	2	03	100	25	-	125	II	12
								III	12
								IV	12

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 welds for axial loads and eccentric loads, unstiffened seat connections, butt welds, design of axially and eccentrically loaded butt welds.

2. Bolted Connections: Introduction, Advantages/ Disadvantages, Types of bolts, types of bolted connections, design 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 axially 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 axially 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 Moments

Module - IV

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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 stress, design of laterally unsupported beams.
Built-up beams: Design of plated built-up beams, check for bending stress, shear stress, deflection, curtailment of cover plates.

C. 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 structures by S.K. Duggal
4. Design of steel structures by L.S.Negi
5. Design of steel structures by Ramchandra, Vol-I, Vol-II
6. IS 800-2007-General construction in steel code of practice
7. IS 875-1987
8. Steel tables