

GOA UNIVERSITY
SCHEME OF INSTRUCTION AND EXAMINATION

REVISED COURSE IN 2008-09

TE (CIVIL) SEM VI

Sub code	Name of the Subjects	Scheme of Instruction Hrs/Week			Scheme of Examination				
		L	T	P	Th. Dur (Hrs)	Marks			
						Th.	S	P	Total
6.1	Structural Design & Detailing in Concrete	3	1	-	03	100	25	-	125
6.2	Transportation Engineering -II	3	1	-	03	100	25	-	125
6.3	Geotechnical Engineering -II	3	1	-	03	100	25	-	125
6.4	Environmental Engineering -I	3	1	-	03	100	25	-	125
6.5	Design of Steel Structures -II	3	1	-	03	100	25	-	125
6.6	Surveying -II	3	1	-	03	100	25	-	125
	Practicals for subject 6.1	-	-	2	-	-	-	25	25
	Practicals for subject 6.4	-	-	2	-	-	-	25	25
	Practicals for subject 6.5	-	-	2	-	-	-	25	25
	Practicals for subject 6.6	-	-	2	-	-	-	25	25
	TOTAL	18	06	08	-	600	125	100	850

NOMENCLATURE

L - Lectures

T-Tutorials

P-Practicals.

Th. Dur. - Duration of Theory Paper

Th - Theory

S - Sessional,

P- Practical,

O - Oral.

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

Dr. Y. G. GUPTHA
Professor And Head of Civil Engg
Goa Engg. College, FARMAGUDI
PONDA-GOIA 403 401

(CE. 6.1) - STRUCTURAL DESIGN & DETAILING IN CONCRETE

- A. **Course objective:** With the prior knowledge of Structural Analysis, Geotechnical Engineering and structural design in concrete- I, this course imparts the knowledge of structural design of a reinforced concrete structure using 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 limit state method.
 3. Detail the reinforcement as per the design.

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 No. I

Limit state method, analysis, design & detailing of Singly reinforced, Doubly reinforced, and flanged sections. Concept of shear, bond, and torsion. Codal provisions. Design of biaxially loaded short & long columns & Stair cases

Module No. II

Design of continuous beam, Design of isolated footings subjected to Biaxial loads & Combined footings

Module No. III

Retaining walls- Cantilever & Counterfort

Module No. IV

Fundamentals of Bridges, systems & loading standards as per IRC. Actual design & detailing of slab type bridge

C. Tutorials

Analysis and design of structural members like continuous beam, portal frame, and floor grid using the softwares

D. Practicals

RCC drawings for various structural members

E. Text Books:

Reinforced concrete structures - by Sinha, S.K.Roy

Dr. K. G. GUPTHA
 Professor And Head of Civil Engg.
 Goa Engg. College, FARMAGUD.
 BONDA-GOIA 403 401

Reinforced concrete - by B.C.Punia , A.K.Jain & A.K. Jain
Reinforced concrete structures - by Furgussion Tata Mc Grafill
Reinforced concrete - by Nilson

F. 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.

K. G. Gupta
Dr. K. G. GUPTHA
Professor And Head of Civil Engg
Goa Engg. College, FARMAGUCCI
PONDA-GOIA 403 401

(CE 6.2) - TRANSPORTATION ENGINEERING II

- A. **COURSE OBJECTIVES:** This course aims at imparting knowledge with regards to planning and design of Railways and Harbours. It also imparts knowledge regarding Bridges, necessity of maintenance and latest tunneling techniques.
- B. **INSTRUCTIONAL OBJECTIVES:** At the end of this course, the students will be able to:
1. Gain thorough knowledge with reference to development and constructional aspects of railways, harbours, bridges and tunnels.

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

Module I

1. Geometric design of railways:

Introduction - typical cross - section - various gauges - coning of wheels and tilting of rails - functions and requirements of component parts of a railway track - creep of rails - geometrical design of railway track - horizontal curves - radius - superelevation - cant deficiency - transition curves - safe speed on curves - different types of gradients - grade compensation - worked out problems

2. Railway operation and control:

Points and crossings and their design - track junctions and simple track layouts - details of different types of stations and yards - signaling and interlocking - control of train movements - absolute block system - automatic block system and CTC system

Module II

3. Railway construction and maintenance:

Construction of railway track-earthwork - plate laying and packing - maintenance of track-alignment - gauge - renewal of component parts and drainage - modern methods of track maintenance

4. Tunneling:

Tunnel alignment and grade - size and shape of a tunnel - methods of tunneling in hard rocks - full face method - heading and bench method - drift method - different methods of tunneling in

Dr. K. A. GUPTHA
Professor and Head of Civil Engg.
Goa Engg. College, FARMAGU
PONDA-GOIA 403 401

soft soils including compressed air and shield tunneling - shafts in tunnels - ventilation of tunnel and various methods - lining of tunnels - drainage and lighting of tunnels

Module III

5. Bridge Engineering:

Introduction, Foundation, types of Substructure and Superstructures, composite Bridges, Bearings and Expansion joints, Afflux, Approaches, Bridge Architecture, Clearance and Freeboard, Economic span, Joints, Maintenance of Bridges, Rebuilding of Bridges, Testing and strengthening of Bridges. Bridge Alignment, Design loads for bridges,

Module IV

6. Docks and harbours:

Classification of harbours - effect of tides, waves and wind in the location and design of harbour - component parts of harbours - site selection - principles of design - construction and maintenance of wet and dry docks - breakwaters - brief study of harbour appurtenances such as lock and lock gates - quays - jetties - landing piers - fenders - dolphins - slip ways - aprons - transit sheds - ware houses - navigational aids such as light-house - buoys - beacons - study of some important Indian harbours. Objectives of dredging, Dredging equipments.

C. TEXT BOOKS

Airport Engineering : Khanna and Arora
Harbour, Dock and Tunnel Engg.:Shrinivasan and Rangwala
Bridge Engineering : D.R.Pathak,

D. REFERENCE BOOKS

Bridge Engineering : Rangwala
Bridge Engineering : S.P.Bindra
Docks and Harbour: Algia
Design of Bridge structures by Jagadeesh and Jayaram

LD
Dr. K. G. GUPTHA
Professor And Head of Civil Engg.
Goa Engg. College, FARMAGULI,
ONDA-GOIA 403 401

(CE 6.3) - GEOTECHNICAL ENGINEERING II

- A. **COURSE OBJECTIVES:** Understanding the mechanisms of soil stress distribution, bearing capacity from shear strength and settlement consideration, behavior of piles and wells. Course shall also cover soil slope stability.
- B. **INSTRUCTIONAL OBJECTIVES:** At the end of this Course, the student will be able to understand:
- (1) soil slope stability analysis;
 - (2) soil stress distribution and settlement;
 - (3) to compute bearing capacities and settlement from given properties;
 - (4) behavior of pile foundations, well foundations and machine foundations.

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

Module -I

1. **Stress Distribution:** Introduction, Boussinesq Equation – Stress distribution due to concentrated load, pressure Distribution, Boussinesq Stress distribution due line load, strip load, uniformly loaded Circular area & rectangular area, Newmark's influence chart, Westergaard's analysis – basic concepts.
2. **Stability of Slopes:** Introduction, stability analysis of finite and infinite slopes, Swedish circle and friction circle method, method of slices for $c-\phi$ soil, Fellenius construction, Taylor's Stability number and stability curves.

Module-II

3. **Bearing Capacity:** Definition, General shear and local shear failure, Terzaghi bearing capacity equation for shallow foundation, IS Code method of determination of bearing capacity, factors influencing bearing capacity, Introduction to Meyerhof's bearing capacity theory, use of plate load test, pressure-meter test and SPT in assessing safe bearing capacity.
4. **Settlement Computations:** Definition, Types of settlements, computations based on theory and test results, Effect of width and depth of foundation, construction time settlement, Permissible settlements as per I.S.I.

Dr. K. G. GUPTHA
Professor and Head of Civil Engg.
Goa Engg. College, FARMAGUCCI
PONDRA-GOIA 403 401

Module -III

5. **Shallow Foundation** : Types of foundation, Minimum depth of foundation, contact pressure distribution, isolated square and rectangular footing, combined rectangular, trapezoidal & Strap footing and Raft foundation.
6. **Pile Foundation**: Classification of piles, Load carrying capacity of single pile- Static and Dynamic approach, Pile load tests-initial and routine, Group action in piles, Negative skin friction, under-reamed pile.

Module -IV

7. **Caisson and Well Foundation**: Introduction, Shapes of wells and component parts, Forces acting on well foundation, grip length & scouring depth, bearing capacity of well foundation, well curb, cutting edge, steining and bottom plug, well sinking, pneumatic caissons.
8. **Sheet pile**: Introduction and application, analysis of cantilever sheet pile and anchored sheet pile with free earth support.

TUTORIAL

During tutorial students shall solve the problems based of above course content.

C. TEXT BOOKS :

Punmia, B.C,	Soil Mechanics And Foundation
Kasmalkar,	Foundation Engineering
Brahma,	Foundation Engineering
Alam Singh	Modern Geotechnical Engineering.

D. REFERENCES :

K.Purushotam Raj	Geotechnical Engineering
Swami Saran	Design of sub-structures
Bowels J,	Analysis and Design of Foundations
Nayak N V	Foundation Engineering Handbook
Relevant I S I Codes	

Dr. K. D. GUPTHA
Professor And Head of Civil Engg.
Goa Engg. College, FARMAGUDA
WONDA-GOA 403 401

(CE6.4) - ENVIRONMENTAL ENGINEERING - I

A. **COURSE OBJECTIVES:** This course will help in application of principles of Environmental Engineering with reference to water treatment and analysis of distribution network. Knowledge of Environmental Engineering helps in design of water supply projects as a Civil Engineer.

B. **INSTRUCTIONAL OBJECTIVES:** At the course the students will be able to -

1. Understand characteristics of water
2. Design a water supply system

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

Module - I

1. Water supply engineering - Importance and necessity of community water supply schemes - essentials of water supply engineering - water demands, various types of water demands, total requirement of water for a town or a city, per capita demand, factors affecting losses and wastes. Variation in Demand-effects, Design periods, Population forecasting methods.
2. Sources of water - Surface water sources - suitability of the source with respect to quantity and quality - intakes for various surface water sources - design of intakes - ground water sources - development and protection of ground water sources - estimation of yield from various ground water sources - construction of tube wells - maintenance.

Module - II

3. Quality of water - Drinking water standards - Physical, Chemical and Bacteriological analysis of water, Treatment of water - aeration - coagulation - flocculation - sedimentation - filtration - disinfection - design of all the units.

Module - III

4. Miscellaneous treatments - Removal of colour, taste and odour, iron and manganese and hardness - fluoridation and de-fluoridation. Removal of radioactivity from water, Desalination of Brackish water. Domestic methods of treating water supplies.

Dr. K. S. 
 Professor and Head of Civil Engineering
 Goa Engg College, FARMAGUDDER
 QONDA-GOIA 403 401

5. Water supply of small communities in rural areas Introduction, Source of water for small communities in rural areas, Selection of suitable source of water. Quantitative requirements of water in rural water supply schemes. Treatment methods for high fluoride water in a given source. Treatment for removing iron. Chlorinating small community supplies.

Module - IV

6. Distribution System – General Introduction, Requirement of a good distribution system, Arrangement of Distribution Pipes and other Accessories, Layout of Distribution Network, Method of Distribution, Pressure in the Distribution System, System of Supply, Function of Distribution Reservoirs, Type of Distribution Reservoirs, Stand Pipes, Storage Capacity of Distribution Reservoirs, Location and Height of Distribution Reservoirs, Detection of Leakage in the Distribution Pipes, Design of Distribution System, Appurtenances in the Distribution System.
7. Water Supply Plumbing System In Building and Houses-Plumbing System in Water Supplies, The House Water Connection, Stop Cock, Water Taps and Bib Cocks, Pipe Fitting, Storage of Water in Buildings, Water Piping System in Building, Design Consideration for Water Piping Systems in Building. Hot Water Requirement, Domestic Hot Water Appliances, Solar Water Heater, Centralized Hot Water Systems.
8. Water treatment in swimming pools – Layout, shape and design of swimming pool water and its surroundings. System of supply in swimming pools and recycling of pool water. Pollution zone in a swimming pool. Controlling the water quality in a swimming pool. Chlorination of water in a swimming pool.

C. PRACTICAL COURSE

- a) At least 10 practicals on water quality testing
 1. Determination of solids (total, dissolved, suspended, organic inorganic, settleable) in water
 2. Determination of turbidity
 3. Determination of alkalinity
 4. Determination of hardness of water
 5. Determination of pH
 6. Determination of chlorides
 7. Determination of iron and manganese
 8. Determination of sulphates
 9. Determination of optimum dosages using Jar test
 10. Determination of dissolved oxygen.
 11. Determination of available chlorine in bleaching powder and test for residual chlorine
 12. Tests on coliforms
1. Field visit to a Water supply treatment plant and submission of report

Dr. K. G. GUPHA
Professor And Head of Civi Engg
Goa Engg. College, FARMAGUDI
GOA 403 401

D. TEXT BOOKS

1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers.
2. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
3. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers

E. REFERENCES

1. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.
2. Water and Waste Water Technology by Steel
3. Water and Waste Water Engineering by Fair Geyer and Okun
4. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India
5. Waste water Engineering by Metcalf and Eddy.
6. Unit operations in Environmental Engineering by R. Elangovan and M.K. Saseetharan, New age International

Dr. K. G. ^{KS} GUPTHA
Professor And Head of Civil Engg
Goa Engg. College, FARMAGUCI
BONDA-GOA 403 401

(CE 6.5) - DESIGN OF STEEL STRUCTURES - II

A. **COURSE OBJECTIVES:** The course objective is to familiarize students with structural steel design of residential and industrial building components like roof truss, plate girder. The course also familiarize students with specialized structures like microwave towers, transmission towers and foundation of towers. Course enable student to understand and apply the theory of structural plastic analysis to determine the collapse load of steel members and systems and, analyse and design structural steel system using the plastic design concepts.

B. **INSTRUCTIONAL OBJECTIVES:** Demonstrate competency to design a steel building components and other specialized steel structures using correct loads, selecting proper materials, conducting analysis and designing the members in an economical manner to satisfy the requirements of the Specified/applicable IS or international standards.

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. **Design of Roof Trusses**
Introduction, Types of roof trusses, components of roof trusses, roof coverings, Loads, combination of loads, Design of roof truss members, design of purlins, Lateral bracings of trusses.

Module - II

2. **Design of Plate Girder**
Introduction, Elements of plate girder, Design members, Economical depth & self weight, Design of web plate, design of flanges, Curtailment of flange plates, Connection of flange angles to web, connection of flange angles to cover plate, Intermediate vertical stiffeners, Horizontal Stiffeners, Bearing Stiffeners, Web splice, flange splice, Design of riveted/ welded plate girder.

Module - III

3. **Plastic Analysis & Design**
Introduction, ultimate load carrying capacity of members in axial tension & compression, plastic bending of beams, plastic moment, shape factor, plastic hinge, load factor, conditions and basic theorems of plastic analysis, determination of collapse load, design recommendations, limitation of plastic analysis.


Dr. K. G. GUPTHA
 Professor And Head of Civil Engr
 Goa Engg. College, FARMAGU
 PONDRA-GOIA 402 401

Module - IV

4. Gantry Girders

Introduction, Permissible stresses, Loads acting on Gantry Girders, Types of Gantry Girders and Crane rails, Crane Data, Maximum moments and Shears, design.

C. PRACTICALS:

1. Design of steel beams/columns/ foundations using excel spread sheets.
2. Analysis and design of steel beams/steel floor grids and portal frame/steel truss using software.
3. Experiments on establishing relationship between max loading and plastic hinge formation.

D. 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

K. G. Gupta
Dr. K. G. GUPTHA

Professor And Head of Civil Engg.
Goa Engg. College, FARMAGUDA
BONDA-GOA 403 401

(CE6.6) - SURVEYING – II

- A. **COURSE OBJECTIVES:** This course introduces advanced surveying instruments and techniques. It helps in setting out works practically. It helps in understanding the methods of hydrographic surveying
- B. **INSTRUCTIONAL OBJECTIVES:** At the end of this course, the student will be able to;
1. Understand advanced surveying techniques such as remote sensing and geodetic surveying
 2. Plotting contour plans.
 3. Understanding different techniques of hydrographic surveying
 4. Setting up of works.

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

Module-I

1. Tacheometric Surveying-General principles of Tacheometry and different types of tacheometers. Principles of stadia methods. Determination of instrument constants. Derivations of distance and elevation formulae for vertical and normal holding of the staff. Reduction of Tacheometric data. Use of tacheometric tables and other graphs.
2. Introduction to advanced instruments- Total Station, GPS receiver
3. Hydrographic Surveying : Shoreline survey, River survey, Soundings, Methods of locating soundings, Three-point problem

Module-II

4. Setting out works: Setting out buildings, culverts, bridges, tunnels. Surface alignment, setting from ends, transferring the alignment underground, transferring levels underground. Accuracy in tunnel surveying, Wiesbach Triangle.
5. Curves: Basic definitions, Different types and their characteristics, Simple, Compound & Reverse curves. Methods of setting above curves. Transition curves. Necessity, Requirements., Clothoid, Cubic, Spiral curves & Superelevation. Bernoulli's lemniscates, methods of setting Transition Curve: Geometry & Setting out. Obstacles in setting out of curves.

Dr. K. V. GUPTHA
Professor And Head of Civil Engg
Soa Engg. College, FARMAGUDA
BONDA-GOIA 403 401

Module-III

6. Remote Sensing: Introduction- Remote sensing system- data acquisition and processing; Applications; Multi concept in remote sensing. Physical basis of remote sensing- Electro-magnetic radiation (EMR)- nature, nomenclature and radiation laws; Interaction in atmosphere- nature, its effects in various wavelength regions, atmospheric windows; Interaction at ground surface- soils and rocks, vegetation, water. Remote sensing observation platform, Sensors.
7. Geographical Information systems: Introduction, objectives, components, topology, Data model and Data Structure, Errors in GIS, Linkage of GIS to remote sensing, Applications

Module - IV

8. Geodetic Surveying: Definition & scope of Geodetic survey. Principles of triangulation & classification. Reconnaissance, choice of stations, intervisibility & height of stations. Signals- different types. Satellite stations & reductions to centre, baseline measurement

C. PRACTICALS

1. Determination of reduced levels using Tacheometer.
2. Determination of reduced levels using Total Station
3. Setting out of a typical Building plan
4. Setting out of different types of curves
5. Study of sounding methods.
6. Drawing of CS, LS & contour map for a specified area (manually or using software)
7. Determination of RL by single plane & double plane method.

D. TEXT BOOKS

- 1) Surveying vol. I, II, III - B.C. Punmia
- 2) Surveying & Levelling vol. I & II - Kanetkar and Kulkarni

E. REFERENCE BOOKS

- 1) Plane & Geodetic Surveying - David Clark
- 2) Surveying - S.K. Duggal

K. G. Gupta
Dr. K. G. GUPTHA
Professor And Head of Civil Engg
Goa Engg. College, FARMAGUDA
BONNAR GOA 403 401