

# GOA UNIVERSITY

## SCHEME OF INSTRUCTION AND EXAMINATION

REVISED COURSE IN 2007-08

### SE (CIVIL) SEM IV

Sub code	Name of the Subjects	Scheme of Instruction Hrs/Week			Scheme of Examination					
		L	T	P	Th. Dur (Hrs)	Marks				
						Th.	S	O	P	Total
4.1	Numerical Methods in Computer Programming	3	1	-	3	100	25	-	-	125
4.2	Structural Analysis -I	3	1	-	3	100	25	-	-	125
4.3	Fluid Mechanics -II	3	1		3	100	25	-		150
4.4	Surveying -I	3	1		3	100	25	-		150
4.5	Geology	3	1		3	100	25	-		150
4.6	Building Drawing -I	3	1		3	100	25	-		150
	Fluid Mechanics -II			2	-				25	25
	Surveying -I			2	-				25	25
	Geology			3	-				25	25
	Building Drawing -I			3	-				25	25
	<b>TOTAL</b>	18	06	10		600	150	-	100	850

### NOMENCLATURE

L. -- Lectures

S - Practical

P - Practical

Th. Dur. -- Duration of Theory Paper

O - Oral

P - Practical

P- Practical,

O - Oral.

NOTE: 1.

12 lectures per module

2.

At least 8 experiments to be conducted based on the syllabus unless otherwise specified

Professor and Head of Civil Engg  
College

# 4.1 NUMERICAL METHODS & COMPUTER PROGRAMMING

Sub code	Name of the Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
		L	T	P	Th. Dur (Hrs)	Marks				Total
						Th.	S	O	P	
4.	Numerical Methods and Computer Progg	3	1	1	3	100	25	-	-	125

## MODULE-I

I. Finite difference and interpolation: Forward, Backward, Central, Divided differences, Difference tables, Taylor's operator  $-d$ , Shift Operator  $-E$ , averaging operator  $-\mu$ , difference of polynomials, factorial polynomials Newton Forward & backward difference interpolation, Lagrange's interpolation, Newton divided difference interpolation ( derivation, problem solving, algorithm and computer programming), Stirling's and Bessel's interpolation formula

## MODULE-II

II. Solutions of Equations: Solution of non-linear equations of single variable using Bisection method, False position method, Newton-Raphson method, secant method( problem solving, algorithm and computer programming), Order of convergence of these methods, comparison of these methods.

III. Numerical Integration: Newton- Cote's Quadrature formula, Trapezoidal rule, Simpson's 1/3 & 3/8 rules, Weddle's rule(problem solving, algorithm and computer programming), Romberg's integration( Richardson's Extrapolation). Comparison of the above methods and their error estimation.

## MODULE-III

IV. Numerical solution of differential equations:- Picard's method, Taylor series method, Euler's method, Modified Euler's method, Runge-Kutta methods, Milne's Predictor-Corrector method(problem solving, algorithm and computer programming).

## MODULE-IV

V. Numerical solution of Partial differential equations: Solution of Laplace equation, Heat equation & Wave equation by finite difference method.

VI. Solution of linear algebraic equations: Gauss Elimination method, Gauss- Jordan method, Jacobi's Method, Gauss-Seidel iterative method(problem solving, algorithm and computer programming). Concept of ill conditioned and well conditioned system, comparison of the above methods.

## Text Books and References

1. Grewal B. S. : Numerical Methods, Khanna Publications
2. Kandasamy P. : Numerical Methods , S. Chand & Co., New Delhi
3. Dr. D. S. C.: Engineering Mathematics part III
4. E. Balagurusamy: Numerical Methods
5. S. S. Sastry: Introductory methods of Numerical Analysis
6. V. Rajaraman: Computer Oriented Numerical Methods

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						Th.	S	O	P	Total
4.2	Structural Analysis	3	1	-	3	100	25	-	-	125

## MODULE - I

## I. Elastic theorems and energy principles

Strain energy and complementary energy - Review of strain energy due to axial load - Bending, shear and torsion - Principle of superposition - Principle of virtual work - Castigliano's theorem for deflection - Theorem of complementary energy - Betti's theorem - Maxwell's law of reciprocal deflections - Principle of least work - Application of method of virtual work (unit load method) and strain energy method for determination of deflections of statically determinate beams - Pin-jointed trusses and rigid frames - Temperature effects

## MODULE - II

## II. Fixed and continuous beams

Statically indeterminate structures - Degree of static and kinematic indeterminacies - Brief introduction to force and displacement methods - Fixed and continuous beams - Force method - Analysis by consistent deformation method - Application of moment area and conjugate beam methods for fixed beams - Theorem of three moments for continuous beams - Shear force and bending moment diagrams - Deflection and support settlement

## MODULE - III

## III. Moving loads and influence lines

Introduction to moving loads - Concept of influence lines - Influence lines for reaction, shear force and bending moment in simply supported beams and overhanging beams - Influence lines for forces in trusses - Analysis for different types of moving loads - Single concentrated load - Several concentrated loads - Uniformly distributed load shorter and longer than the span

## MODULE - IV

## IV. Cables, suspension bridges &amp; arches

Analysis of forces in cables - Temperature effects - Suspension bridges with three hinged and two-hinged stiffening girders - Theory of arches - Eddy's theorem for two-hinged and fixed arches - Settlement and temperature effects

Reference books

## 4.3 FLUID MECHANICS - II

Sub code	Name of the Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
		L	T	P	Th. Dur (Hrs)	Marks				
						Th.	S	O	P	Total
4.3	Fluid Mechanics-II	3	1	2	3	100	25	-	25	150

### MODULE - I

#### I. Free Surface Flow and Pipe flow

##### Types of Flow in Channels

##### Uniform flow in open channel

##### Hydraulically efficient Sections-Rectangular, Circular and Trapezoidal

##### Concept of Specific Energy. - Specific Energy Equations for Rectangular Channels

##### Application of Specific Energy and Specific Force

##### Channels in transition, Characteristics of Critical Flow, Occurrence of Critical Flow

##### Critical Depth in Trapezoidal & Circular Channels

#### II. Non -Uniform flow in open channel

##### Rapidly varied flow- Hydraulic Jump and its analysis-Classification of Jumps- Characteristics

##### f Jumps in rectangular Channels -Stilling Basin- Classification of flow profiles -Jump as an

##### Energy Dissipater

##### Equation of Gradually varied flow, Backwater Curve and Afflux

### MODULE - II

#### I. Spillways

##### Introduction -siphon spillway, chute spillway.

##### Design of Canals -Typical Canal Cross Sections -Lining the Canals

##### Seepage Prevention with Impermeable membranes -Failure of Canal Lining

##### Most Efficient Hydraulic Section, Design of Unlined Channels

#### V. Dimensional Analysis

##### Scope; Principles, Rayleigh's and Buckingham's method, Dimensional Ratio's application's.

##### Similarity Laws, model Studies, undistorted Models and Distorted models

### MODULE - III

#### Impact of free jets

##### Application of momentum equation on stationary and moving vanes

##### Classification of Hydraulic turbines -Impulse turbines- Pelton Wheel - Reaction Turbine-

##### Francis Turbines-Performance characteristics of Hydraulic turbines, Draft tube-types, specific

##### Speed, Surge Tanks

#### Pumps

##### Working of pumps-Centrifugal Pumps- Minimum starting speed-Multistage pumps- Pumps in

##### series and parallel-Performance characteristics, Losses and efficiency of Centrifugal Pump,

##### Operational Difficulties in Centrifugal Pump, NPSH,

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## 4.4 SURVEYING I

Sub code	Name of the Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
		L	T	P	Th. Dur (Hrs)	Marks				
						Th.	S	O	P	Total
4.4	Surveying - I	3	1	2	3	100	25	-	25	150

### MODULE - I

#### Introduction:

Basic definitions, objectives, divisions and Importance of Surveying to Engineers; Classification and Principles of Surveying, Overview of Land Surveying; Surveying measurements and errors. (3 lectures)

#### Basic Surveying Instruments:

Leveling Staff and Compass, Principle of reversal, EDM & accessories- Basic Principle, Errors, Precautions and Problems; (6 lectures)  
Leveling - Different types (Dumpy, IOP & Digital) and their salient parts, Working Principle, Temporary and Permanent adjustments, Sensitivity of level Tube, Errors and mistakes, Leveling Staff;

Theodolite- Different types (Transit and Digital) and their salient parts -Basic terms, Fundamental lines, Temporary and Permanent adjustments, Errors and mistakes in theodolite;

#### Measurement of Distance:

Basic definitions, Methods, Ranging; Errors-types, Corrections and Precautions; Field Problems and their solutions; (3 lectures)

### MODULE - II

#### Measurement of Angles and Direction:

Basic Definitions- meridians, declination-variations, local attraction, Prismatic and Surveyors Compass; Whole circle and reduced bearings. Traversing with chain and compass. Methods; Methods of repetition and reiteration; Errors and mistakes, Corrections and Accuracy; (4 lectures)

#### Plane Table Surveying:

Instruments, Plane table and its accessories Telescopic alidade Basic definitions, Advantages and disadvantages; Setting of instruments, Orientation, methods, Two and Three- point problem, Accuracy in plane table survey, Errors, Precautions, Plotting of details including contours (8 lectures)

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Reciprocating pumps-effect of acceleration and friction of liquids in suction and delivery pipes-application of air vessels and their advantages. Co-efficient of Discharge and slip of reciprocating Pump. Indicator diagram.  
Cavitations - Mechanism

#### MODULE- IV

##### VII. Unsteady Flow

Introduction - Basic Terminology - Classification of waves- Ocean Waves - Tides -Nature of waves

##### VIII. Hydraulic Machines

Working of Hydraulic Crane - Air Lift Pump- Hydraulic Ram- Hydraulic Lift- Jet pump

Hydropower Plant-Introduction- Application-Advantages and Disadvantages-Safety measures in hydropower plants-Comparison of hydropower station with thermal power plants-Hydropower development in India

#### Termwork:

The termwork shall include 6 experiments based on the above Syllabus and 6 assignments.

#### Text book :

1. Hydraulics & Fluid Mechanics by Modi & Seth
2. Fluid Mechanics and Hydraulic Machines by R.K. Rajput

#### Reference Books :

1. Principles of Fluid Mechanics by M.K. Natarajan.
2. Fluid Mechanics by Dr. R.K. Bansal
3. Civil engineering Handbook Vol 3 by V.N. Vazirani & Chandola
4. Flow in Open Channels K Subramanya

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## 4.5 ENGINEERING GEOLOGY

Sub code	Name of the Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination				
		L	T	P	Th. Dur (Hrs)	Marks			
						Th.	S	O	P
4.5	Engineering Geology	3	1	2	3	100	25	-	25
									Total
									150

### MODULE - I

I. Introduction -Geology and its importance.

### II. Physical Geology

Surface relief of earth and agents modifying it. Denudation and deposition. Geological actions by winds, rivers, glaciers, sea and their resulting landforms. Engineering importance of geomorphological processes. Lakes and Lacustrine deposits. Earthquakes and Volcanoes

### MODULE-II

#### III. Petrology

Igneous rocks-origin, classification, modes of occurrence; textures and structures. Sedimentary rocks-modes of formation, textures and structures, classification. Metamorphic rocks-Agents, processes, zones of progressive metamorphism, textures and structures.

### MODULE-III

#### IV. Structural Geology-

Structural elements of Rocks -Dip and strike, folds, joints, faults, unconformity and overlaps. Mountain and Mountain Building.

### MODULE-IV

#### Mineralogy-

Study of crystals-Elements of crystals, Interfacial angle, symmetry characters, classification of crystal systems. Physical properties, chemical composition and uses of minerals.

Stratigraphy of India-General principles of stratigraphy, Divisions of Geological time. Physiographic divisions of India and their characteristics.

#### Practical Work

Identification of minerals and ores.

Identification of various types of rocks.

Geological map reading and construction of sections from a single contour geological map

#### Recommended Books

Fundamentals of engineering geology-F.G.Bell  
Geology for Engineers-LEGGET

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### MODULE - III

#### Determination of Elevation:

Basic Definitions. Dumpy level and tilting level, Curvature & Refraction, Method of Reductions of levels. Differential leveling and field book note, Reciprocal Leveling: Profile leveling, Longitudinal & cross sectioning

Trigonometric Levelling: Introduction, Errors & Mistakes in leveling, Error Propagation: heights & distance with base of the object accessible, base of object inaccessible, with instrument stations in the same vertical plane as the elevated object and instrument station not in the same vertical plane as the elevated object.

### MODULE - IV

#### Contouring:

Contouring: Introduction. Contour interval, methods of contouring, interpolation of contours. Uses of contour maps.

Minor instruments & measurement of areas and Volumes: Use of planimeter, Clinometers, box sextant, line ranger, optical prism, and abney level. Measurement of area and volume by Trapezoidal and Simpson's rule.

#### Transit Theodolite (6):

Parts & optics of transits. Temporary & permanent adjustments. Repetition & reiteration method of measuring horizontal angles.



## 4.6 BUILDING DRAWING - I

Sub code	Name of the Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
		L	T	P	Th. Dur (Hrs)	Marks				
						Th.	S	O	P	Total
4.6	Building Drawing - I	3	1	3	3	100	25	-	25	150

### MODULE - I

Introduction to Building Drawing, its scope, relevance. Relation between Owner, Engineer, Contractor and Architect. Understanding human factors in the design of buildings for Residential purposes. Planning and Development Authority regulations. Building Bye laws. Procedure, enclosures and requirements of legal approval. Principles of planning and Sun diagram.

### MODULE - II

Drawing of Building plans, understanding various components. Derivation of section, elevation, site plan, roof plan, area statement etc. from the data. Use of Auto CAD in deriving a plan.

### MODULE - III

Introduction to perspective drawing; Its importance scope and uses. One and two point perspective. Rules corresponding to perspective drawing.

### MODULE - VI

Interior design and detailing of major building components like-Modular kitchen, False ceilings and Air Conditioning  
Concept of Energy Efficient Buildings

### Term Work:

1. At least 2 sheets on module II- covering load bearing walls, framed structure and sloped roof.
2. One sheet on perspective Drawing module III.
3. One drawing print out using auto CAD and minimum five sketches showing details of different building components.

### Text Books:

Building Drawing by Shah ,Kale and Patki  
Building Drawing by Y.S. Sane.

### Reference Books:

Human factors Design Engg. by Woodson,  
Time Saver Standard Series

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29