

## **Civil Engineering Syllabus**

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### **S.E. Part –I**

#### **1.ENGINEERING MATHEMATICS-III**

#### **Teaching Schemes: Examination Schemes:**

**Lectures: 3 Hours per week Theory Paper: 100 Marks**

#### **SECTION I**

1. Ordinary differential equations of first order and first degree: Methods of solution: Variable separable, Homogeneous, Non-Homogeneous, Exact, Non-Exact, Linear, Non-Linear and Bernoulli's differential equation. **(07)**
2. Linear differential equations: Linear differential equations with constant coefficients (without method of variation of parameters), Homogeneous linear differential equations. **(05)**
3. Partial differential equations: Four standard forms of partial differential equations of first order. **(05)**
4. Applications of first order and first-degree differential equations and linear differential equations with constant coefficients to orthogonal trajectories and civil engineering problems. **(05)**

#### **SECTION II**

1. Statistics: Coefficient of correlation and lines of regression of bivariate data, Fitting of Curve-Least squares principle. **(05)**
2. Probability: Random variable, Binomial, Poisson and Normal distributions. **(07)**
3. Vector Calculus: Differentiation of vectors, tangent line to curve, velocity and acceleration, Gradient, Divergence and Curl of vector field, Solenoidal, irrotational and conservative vector field. **(05)**
4. Complex variables: function of a complex variable, Analytic function, Cauchy-Riemann Equations, Conformal mapping, Bilinear mapping. **(05)**

#### **LIST OF RECOMMENDED BOOKS : ENGINEERING MATHAMETICS-III**

1. A textbook of Applied Mathematics Vol I & II by J.N. & P. N Wartikar-Vidhyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by B.S.Grewal-Khanna Publication, Delhi.
3. Advanced Engineering Mathematics by Jaffi and Mathur-Dhanpatrai and Sons, Bhopal.
4. A textbook of Applied Mathematics by N.P.Bali, Ashok Saxena and N. Ch. S. N. Iyengar-Laxmi Publication, Delhi.
5. Advanced Engineering Mathematics by Kreyzig-John wiley & SMS, New York.

#### **NATURE OF QUESTION PAPER**

1. Duration of paper shall be 3-hours carrying a maximum of 100 marks.

2. There shall be TWO sections each containing 4 question topic wise.
3. Total six questions will have to be attempted i.e. any three from each section.
4. Each section shall carry 16 to 17 marks.
5. Use of non-Programmable calculator is allowed.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 3*

## **S.E. (Civil) Engineering Part I**

### **2.STRUCTURAL MECHANICS I**

**Teaching Schemes: Examination Schemes:**

**Lectures: 4 Hours per week Theory Paper: 100 Marks**

**Practical: 2 Hours per week Term Work : 25 Marks**

#### **SECTION I**

##### **Unit 1. (06)**

Scope of the subject, Behaviour of Engineering materials under axial loading, Simple stresses and strains, Hook's law, Stress strain relations for ductile and brittle

material, elastic constants, working stress, Factor of safety, Stresses & strains in three

dimensions, normal and shear stresses, Complementary shear stress, relation between

elastic constants, assumption in elastic analysis, St. Venant's principle.

##### **Unit 2. (03)**

Composite sections under axial loading: compound bars, temperature stresses in composite sections.

##### **Unit 3. (07)**

Analysis of statically determinate beams: S.F. and B.M. diagrams for beams subjected to point load (include load also), uniformly distributed load, uniformly varying load and couples. Relation between intensity of load, shear force and bending moment.

##### **Unit 4. (04)**

Thin walled cylinders and spheres, wire wound thin cylinders.

#### **SECTION II**

##### **Unit 5. (05)**

Bending stresses in beams: Simple bending theory, pure bending of beams, flexure formula, moment of resistance of different cross sections, built-up sections,

Rectangular, Circular and flanged sections.

##### **Unit 6. (04)**

Shear stresses in beams: Distribution of shear stresses in beams of various commonly used sections such as rectangular, triangular, circular, T and I sections.

**Unit 7. (03)**

Composite beams: Bending stresses in composite beams of two different materials, Equivalent sections, Flitched beams.

**Unit 8. (04)**

Torsion of circular shafts: Torsion formula, solid and hollow circular shafts, transmission of power through circular shafts.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 4*

**Unit 9. (04)**

Strain energy due to axial force gradually, suddenly applied and impact load, Resilience. Strain energy due to shear force, bending moment and torque.

**TERM WORK**

Term work shall consist of:

(B) Experiments (any six):

1. Tension test on Mild and Tor Steel.
2. Compression test on Mild Steel & Cast Iron.
3. Compression test on Timber (Parallel and Across the Grains).
4. Shear test on Mild Steel.
5. Brinell or Rockwell Hardness test on different metals.
6. Bending test on Mild Steel Beam (Flexure Formula).
7. Torsion test on Mild Steel and Cast Iron.
8. Impact test on Mild Steel, Aluminium, Brass, Copper and Cast Iron

(C) Experiments (any two):

1. Flexural test & Abrasion test on flooring tiles.
2. Water absorption, Efflorescence and Compression test on burnt Bricks
3. Compression test on stones.

(D) At least one numerical assignment on each unit.

**REFERENCE BOOKS**

1. Strength of Materials by Ramamurtham.
2. Analysis of Structures Vol I by Vazirani and Ratwani, Khanna Pub., Delhi.
3. Mechanics of Structures (Part I) by S.B.Junnarkar, Charotar Book House, Anand.
4. Strength of Materials by Bhavikatti.
5. Elements of Strength of Materials, (Recent Edition) by S. Timoshenko and J. Young Affiliated East-West
6. Strength of Materials by F.L. Singer, Harper and Row Pub., New York.
7. Introduction to Mechanics of Solids by E.P.Popov. 3rd Ed. (1981), Prentice-

Hall of India.

8. Mechanics of Materials by Gere and Timoshenko, C.B.S. Delhi.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 5*

### **S.E. (Civil) Engineering Part-I**

### **3. SURVEYING I**

#### **Teaching Scheme: Examination Scheme:**

Lectures: 3 Hours /Week Theory Paper : 100 Marks

Practical: 2 Hours/Week Term Work : 25 Marks

Practical/Oral: 25 Marks

#### **SECTION I**

##### **Unit 1 Levelling**

- a) Definition, Technical Terms, Classification, Methods for reduction of levels (1)
- b) Dumpy level, Auto level, Tilting level: Construction, temporary and permanent adjustments, use (3)
- c) Sensitivity of bubble tube, Reciprocal leveling curvature and refraction correction, distance to visible horizon, Precise leveling, (3)

##### **Unit 2 Measurement of Angles and Directions**

- a) Technical Terms: Meridian, Bearing, Declination, Variation, Dip, Included Angle, Corrections (1)
- b) Theodolite: construction and use, measurement of horizontal angle, deflection angle, vertical angle, bearing, prolonging a line, lining in ,setting out angles Testing and permanent adjustments, Theodolite traversing: field work, computation of consecutive and independent coordinates, Gale's traverse table and adjustment of closed traverse, Omitted measurements, Trigonometric leveling (10)

##### **Unit 3 Hydrographic survey**

- a) Hydrographic survey: purpose, sounding, Nautical sextant, plotting (3)
- b) Minor Instruments: construction and use of Hand level, Abney level, Ghat tracer, Box Sextant, Proportional compass (2)

##### **Unit 4 Modern Surveying Instruments**

- a) Electromagnetic waves and their properties, phase, phase comparison, modulation, Types of EDM instruments: Geodimeter, Tellerometer, Distomat: principle, construction and use (3)
- b) Total station: construction and use (3)

##### **Unit 5 Plane table survey**

Plane table survey: Equipment and accessories, advantages, disadvantages, temporary adjustments, methods: radiation, intersection, traversing and resection: two

point and three point problems, tangent clinometer, telescopic alidade (5)

### **Unit 6 Area and volume determination**

a) Contouring: Characteristics, Direct and Indirect methods, Interpolation techniques

and uses of contour maps (2)

b) Computation of area and volume: coordinate method, Trapezoidal Rule, Prismoidal

Rule, Planimeter, Capacity Contours (2)

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 6*

### **TERM WORK**

A) Field book containing the following experiments

1) Levelling

a) Revision of differential leveling

b) Reciprocal leveling

c) Sensitiveness of bubble tube

d) Permanent adjustments of dumpy level

e) Auto level and tilting level

2) Study of Theodolite

a) Measurement of horizontal angle by various methods,

b) Measurement of magnetic bearing and

c) vertical angle by Theodolite

d) Trigonometrical levelling

3) Giving lineout for small residential plan

4) Minor instruments

a) Hand Level

b) Aboney Level

c) Box sextant

d) Ghat tracer

e) Proportional compass

f) Planimeter

5) Methods of plane table survey

a) Radiation

b) Intersection

c) Two point and three point problems

6) Hydrographic Survey:

a) Study and use of Nautical Sextant and measurement of angles.

b) Solution of Three point problem by Analytical and any one graphical method.

7) Study and use of Total Station

B) Projects:

1) Block contouring project

2) Theodolite traversing project

3) Plane Table Survey of a closed traverse of minimum four sides for at least 0.5 Ha. Area with details such as buildings roads etc.

Practical and oral examination shall be based on the above syllabus.

### **RECOMMENDED BOOKS**

1.Surveying –B. C. Punmia,, S.K.Jain, Vol. I and II, Laxmi Publication, New Delhi

2.Surveying and Leveling – T. P. Kanetkar and S. V. Kulkarni Vol.Iand II , -Pune Vidyarthigrih Publication

3.Surveying – Agor -Khanna Publishers,delhi

4.Plane and Geodetic Surveying – David Clark

5.Surveying - Bannister and Raymond

6.Surveying – K. R. Arora Vol. 1 and 2

7.Surveying – Jawaharlal Sharma CBS Publishers, Delhi

8. Surveying and Leveling –N.N. Basak, Tata McGrahill Publishing Co., New Delhi

9. Surveying –S. K. Duggal Vol. 1and 2 Tata McGrahill Publishing Co., New Delhi

10.Plane Surveying - Alok De

11. Text book of Surveying – S.K.Husain, M.S. Nagraj, S.Chand & Co. Ltd., Bombay

12. Surveying- Narinder Singh – Tata Mcgraw Hill Co. Ltd, New Delhi..

*S.E.(Civil Engineering)*

*Solapur University,Solapur-w.e.f.Academic Year 2008-09 7*

### **S.E. ( Civil ) Engineering Part I**

#### **4. BUILDING CONSTRUCTION AND DRAWING**

**Teaching Scheme : Examination Scheme :**

**Lecturer :** 3 No.( Each of One clock hours )

Per week. **Theory Paper :** 100 marks

(4 hrs Duration)

**Drawing :** One turn ,of two hours,

per batch, per week. **Term work :** 25 marks

**Section – I**

**Unit 1.**

Main basic building construction materials

Specific use and properties of the following material :- (7)

- a) Aggregate- fine and coarse b) Stones and Flag stones.  
c) Steel d) Brick e) concrete Blocks f) Cement and Lime mortar

### **Unit 2 (6)**

- a. Building functional Requirements – Strength , Stability, Comfort , convenience, damp prevention , Water Proofing , Heat insulation , Day Lighting, Ventilation, Termite Resistance.  
b. Building Types – Framed and Load Bearing and Composite structure- Comparison between all the three types . Building components (elements) , Methods of transfer of building loads to foundation strata.

### **Unit 3**

Foundation (6)

- a. Importance of foundation as load transferring building element.  
b. Shallow Foundations – Wall footing , Isolated footing , Combined Footing, Strap Footing , Continuous or Strip Footing, Cantilever Footing, Raft Foundation.  
( Reinforcement placement not expected )

### **Section –II**

### **Unit 4**

Masonry and Walls

(7)

- a. Stone masonry walls – UCR, Built to Regular Courses, Ashlar, Composite, Significance of Through Stone & Breaking of Joints.  
b. Brick masonry walls – St. Brick size and Properties of good brick-work. Bonds- Stretcher, Header, Flemish & English bond ( up to 1 ½ Brick thick)  
c. Concrete Block masonry – Hollow and Solid Construction method and bonds.  
d. Concept of Main Wall and Other wall, External wall and Internal wall , Load bearing wall and Partition wall.  
e. Glass Block wall and Curtain wall.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 8*

### **Unit 5**

Doors and Windows

(4)

- a. Doors Types : – Panned, Flush, Glazed.  
Door elements and Fixtures and Fastenings.  
b. Window – Types :– Steel Glazed , Wooden Panned, Alluminium Glazed Sliding  
c. Ventilators and Fixed Glass windows.

### **Unit 6**

#### Stairs and Arches (4)

a. Functional requirements of stair, design of stair, types of stairs, technical terms.

b. Lintels – Necessary and types :- Steel , RCC, Wood, Stone, , Chajjas .  
Types of Arches based on shape , mechanism of load transfer.

#### **Unit 7**

##### Floors (3)

a) Ground and upper floor ; factors for selection of floorings ,  
Types – RCC Slab + Flag stones, Precast beam and slab + IPS .  
Filler joints floor.

b) Types of floor tiles and fixing procedure.

#### **Unit. 8**

##### Roofs (3)

a) Types of Slopping Roofs

b) Selection and suitability of Roof and Roofing materials.

c) Construction details of –

- A.C. Sheet/ G.I. Sheet on steel purlins + steel truss

- Mangalore tile roof

- RCC slab with Brick Bat-Coba , water proofing.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 9*

#### **TERM WORK**

[ One turn of 2 Clock hours, per batch, per week ]

a) Sketch Book – Total 10 free Hand sketching Exercises on Unit 3,4,5,6,  
and 7. Sketching Exercises for line work and Symbols.

b) Plates drawn on ½ imperial size drawing sheets.

Total 5 plates, drawn to scale, on Unit No.3 to 7.

c) CAD and CAD Exercises on Unit No. 3 to 7

Minimum 2 Exercises.

#### **RECOMMENDED BOOKS**

1. A text book of Building Construction- Arora & Bindra- Dhanpat Rai  
Publication, New Delhi.

2. Building Construction- Sushu Kumar- Standard Publishers, Delhi.

3. Building Construction – Arora & Gupta –Satya Prakashan, New Delhi.

4. Building Technology- Ivor H. Seely.

5. Building Construction-Makay vol. I & II

6. Principles of Building Drawing- M.G.Shah and C.M.Kale.

7. National Building Code of India-SP7- Indian Standards Delhi.

8. Various IS Specifications for Drawings, Symbols, Conventional Signs as  
per IS 962-1967- Indian Standards Delhi.

9. Building Construction A to Z – Mantri.

10. Building Materials- TTTI Chandigarh.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 10*

## **S.E. (Civil ) Engineering Part I**

### **5. FLUID MECHANICS-I**

Teaching scheme: Examination Scheme

Lecture: 3 Hours/ week Theory paper: 100 marks

Practical: 2 Hours/ week POE: 25 marks

Term Work: 25 marks

#### **SECTION I**

##### **Unit 1: (03)**

###### **Introduction:**

Scope and importance of Fluid Mechanics. Distinction between solids & fluid, Distinction between liquid, gas, fluid continuum. Physical properties of fluid (density, specific weight, specific volume, sp. Gravity, Viscosity- Newton's law of viscosity, Newtonian & Non-Newtonian fluids, compressibility, surface tension & capillary, vapour pressure, Cavitation ), Ideal fluid, Real fluid. .

##### **Unit 2: (06)**

###### **Fluid Statics:-**

Definition of pressure, units and dimensions, pressure at a point. Pascal's Law, Hydrostatic Law, Piezo-meter, Manometer- ( Simple, Differential & Sensitive), Forces On Plane & Curved Surfaces, Centre Of Pressures & Pressure Diagram, Buoyancy, Meta-centre, Stability Of Submerged Bodies.

##### **Unit 3: (05)**

###### **Fluid Kinematics:**

Velocity and acceleration of fluid particle, Types of fluid- Steady, unsteady, Uniform,

Non-Uniform, Rotational, Irrotational, Turbulent, 1-D, 2-D, 3-D Flow, compressible flow. Streamlines, Equipotential lines, Stream Function & Velocity potential, Flow Net (Properties, Drawing methods, Engineering Applications)

Continuity equation in 3-D flow, Integral form of continuity equations.

##### **Unit 4 : (06)**

###### **Fluid Dynamics:**

Forces acting on fluid in motion, Euler's equation in 1-D Flow, Bernoulli's theorem

limitations, Applications of Bernoulli's equation-Pitot Tube, Venturimeter, Orifice meter, Orifice & mouth pieces, time of emptying the tank through orifices. Problems

on Bernoulli's equation.

## **SECTION-II**

### **Unit 5: (06)**

#### **Flow through Pipes:**

Definition of flow through pipes, classification of flow.

A. Laminar flow:

Reynolds experiment, Couette & Hazen Poiseuille's Equations for Viscous flow between parallel plates & circular pipes.

B. Turbulent flow.

Velocity distribution and Shear Stresses in turbulent flow Nikuradse's Experiment, Elementary concept of turbulent flow in smooth and rough pipes, Introduction to Moody's Chart, Nomograms and pipe diagrams.

### **Unit 6: (04)**

#### **Losses in pipes:**

Darcy Weisbach Equation, factors affecting friction, Minor losses in pipes, Concept

of equivalent length of pipe for different pipe fittings, Equivalent diameter of pipes,

Energy gradient and pressure gradient for pipe with different fitting, pump and Turbine, Hydraulic Power transmission by pipe.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 11*

### **Unit 7: (05)**

A. Pipes in parallel, Series, Siphon, two reservoir problems, pipe network.

B. Water hammer in pipes, Rigid and Elastic Water Column Theory. Surge Tanks-(Function, Location and Uses.)

### **Unit 8 : (05)**

Boundary layer theory:

Concept, Boundary layer along thin plate – Characteristics, Laminar, Turbulent Boundary Layer. Various Thicknesses – Nominal, displacement,

Momentum, Energy. Hydraulic Smooth and Rough boundaries, Separation of Boundary layer, Control of Separation. Drag and Lift of submerged Bodies (Like Flat

plates, Sphere, Cylinder, Aerofoils), Stokes law, Drag and Lift coefficients, Karman Vortex Trail.

## **TERM WORK**

a) Measurement of discharge: Calibration of measuring tank, Measurement of pressure (Piezometer, Manometers, Pressure gauges) Use of hook or point gauge.

b) At least six experiments from the following.

- 1) Verification of Bernoulli's Theorem.
- 2) Determination of met centric heights.
- 3) Plotting of streamlines, flownets.
- 4) Calibration of an orifice/mouthpiece.
- 5) Calibration of venturimeter/orificemeter.
- 6) Study of factors affecting coefficient of friction for pipe flow(at least for two different material and two different diameters)
- 7) Determination of loss of head due to i) Sudden expansion, ii) Contraction, iii) Elbow, iv) Bend, v) Globe valve etc.
- 8) Study of laminar flow.
- c) Study of Moody's charts, nomograms for pipe design.
- d) Simple computer programs.(At least 3 based on the syllabus).

### **REFERENCE BOOKS**

- 1) Fluid Mechanics – A.K.Jain-Khanna Pub., Delhi.
- 2) Fluid Mechanics – Modi & Seth – Standard Book House, Delhi.
- 3) Fluid Mechanics – S.Nagrathanam – Khanna Pub., Delhi.
- 4) Fluid Mechanics – V.I.Streeter & E.B.Wile – McGraw – Hill International Book Co., Auckland.
- 5) Elementary Fluid Mechanics – H.Rouse – Toppan C.Ltd., Tokyo.
- 6) Fluid Mechanics – Garde.Mirajgaonkar – Nemchand & Bross., Roorkee.
- 7) Fluid Mechanics – Shames – McGraw – Hill International Book Co., Auckland.
- 8) Fluid Mechanics – Arora.

*S.E.(Civil Engineering)*  
*Solapur University,Solapur-w.e.f.Academic Year 2008-09 12*

### **S.E. (Civil) Engineering Part I**

#### **6. Engineering Geology**

##### **Teaching Scheme Examination Scheme:**

Lectures : 3 Hours per week Theory Paper : 100 Marks

Practical : 2 hours per week Term work: 25 marks

POE: 50 Marks

#### **Section – I**

##### **Unit1 (01)**

Introduction: Definition, Scope & Subdivision of the subject Geology, interrelation between Geology & civil Engineering.

##### **Unit2 (06)**

**Physical Geology:** Major relief feature of earth, External & Internal forces modifying the surface of earth, Interior of earth,

*Geological Work of River:* Valley development, Normal cycle of river erosion, water, fall ,Dip Slopes & river escarpment, Oxbow lake, pot holes, River capture,

Rejuvenation, Features resulted due to rejuvenation such as canyons, river terrace, inclined meanders.

*Volcano*: Products of volcano, central and fissure type of volcanoes Causes distribution of volcanoes.

*Mountains*: Types, Indian Examples.

### **Unit3 (01)**

Mineralogy: Definition, Physical properties of minerals, Study of important mineral groups, Classification of minerals.

### **Unit4 (08)**

**Petrology**: Definition, Division of rocks,

*Igneous rock*: Formation, mineral composition, Texture and structures, classification,

Civil engineering significance, concordant & discordant intrusion

*Secondary rock*: Formation, classification.

Residual deposit: Soil, Laterite and bauxite.

*Sedimentary rock*: Formation, Texture and classification, Structures, Civil Engineering

Significance.

Chemical & organic deposit.

*Metamorphic rock*: Agents & Types of metamorphism, Stress and antis tress minerals,

Structure of metamorphic rock, product of metamorphism depending on type of Metamorphism and parent rock.

### **Unit5 (05)**

Structural Geology: Outcrop, Dip & Strike, Unconformity- Types, outliers, Overlap.

Fold: Parts of fold, important types, causes, Civil Engineering Significance.

Joints: Types, Civil Engineering Significance.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 13*

## **Section II**

### **Unit 6 (02)**

#### **Hydrology:**

Sources of Ground water, Water Table, Zones of Ground water, Perched water table, Porosity and permeability of rocks, Aquifer, Types of Aquifer, Common Rock

as aquifer. Conservation and management of G.W.Water shed developments and rain

water harvesting.

## **Unit 7 (02)**

### **Building Stones:**

Engineering properties of rocks such as crushing strength, shear strength, tensile strength,

Modulus of elasticity, Durability, Appearance, field character, requirement of good

Building Stone, Building Stones in India.

## **Unit 8 (04)**

Earthquake: Definition, Causes, Seismic waves, Seismograph, Scale, Effect, Precautions, Seismic factor, reservoir induced seismicity (RIS), Seismic zones in India.

## **Unit 9 (02)**

Landslides:

Types, Causes, Stability of hill slopes, Prevention of landslide. Effects and disaster managements.

## **Unit10 (03)**

Preliminary Geological investigation:

Various steps of geological studies of a project site, engineering consideration of structural

Features like dip, strike, joints, fracture, fault, folds, dyke etc. Exploratory drilling, Observations during the process of drilling, preservation of core, core logging, core recovery, R.Q.D., Graphical representation of core log, limitation of exploratory drilling method. Mining geology.

## **Unit11 (03)**

Dams & Reservoir:

Geology of Dam site: Important civil engineering terms in dams and reservoirs, preliminary geological survey, influence of geological condition on various aspect of Dam such as Location, alignment, design and type of a dam, requirement of good dam site, precautions to be taken to counteract unsuitable condition such as unfavorable dips, occurrence of fault fracture, and dyke etc.

Dams on carbonate rocks, Dams on sedimentary rocks, dams on folded strata.

Geology of Reservoir site:

Requirement of good reservoir site, Dependence of water tightness of reservoir area on geological structures and physical properties of rocks, Geological conditions suitable and unsuitable for reservoir, site Effect of rise in the level of groundwater in the reservoir area, rate of silting and its dependence on geological conditions.

## **Unit12 (03)**

Tunneling:

Definition, Important civil engineering terms, difficulties in tunneling such as

over break, seepage of subsurface water, rate of tunneling, roof falls, side collapse etc. Influence of geological condition on tunneling, lining after  
*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 14*

tunneling, Geological condition while choosing tunnel alignment, tunnel in folded strata, tunnels through sedimentary rock, Bridging capacity of rocks.

### **Unit13 (02)**

#### **Geology of Bridge site**

Dependence of types of bridges on geological conditions.

#### **Practical Work**

1. Mineralogy: Physical properties of Minerals. Study of Physical properties and Identification of the following Minerals.

2. Crystalline, Cryptocrystalline & amorphous Varieties of Silica, Orthoclase, Plagioclase, Zeolite, Muscovite, Biotite, Augite, Hornblende, Olivine, Talc, Serpentine, Chlorite, Kyanite, Asbestos, Beryl, Tourmaline, Garnet, Calcite, Gypsum, Fluorite, Corundum etc.

Important ores such as Hematite, Magnetite, Limonite, Pyrite, Psilomelane, Chromites, Chalcopyrite, Galena, Malachite, Graphite

3. Petrology: Study and Identification of the following Rock types

Igneous Rocks: Granite, Pink Granite, Porphyritic

Granite, Syenite, Diorite, Gabbro, Rhyolite, Pumice, Trachyte, Andesite, Varieties of Basalt, Obsidian, volcanic breccia, tachylite, Pegmatite, Graphic Granite, Dolerite.

Secondary Rocks: Laterite, Bauxite, Conglomerate, Braccia,

Sandstone, ferruginous Sandstone, Grit, Arkose Shaaless, Mudsstone, chemical &

organic Limestone, coal.

Metamorphic Rocks: Slate, Phyllite, marble, serpentine marble, Mica Schist, Biotite

schist, muscovite Schist, Chlorite Schist, Talc Schist, Talc Chlorite Schist, Kyanite

Schist, Granite Gneiss, banded granite Gneiss, Augen Gneiss.

4. Study of different types of geological maps, Section and their engineering significance.

5. Study of structural Geological models.

6. Study tour to the place worth visiting from Engineering Geology point of view.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 15*

### **Term Work**

A Journal containing full record of above practical work shall be examined as term

work. Practical Examination based on above practical course.

### **List of Reference Books**

1. Principles of Petrology – By G.W. Tyrrell
2. Principles of physical Geology-By A. Holmes- ELBS, London
3. Textbook of Geology by P. K. Mukharji
4. Structural Geology – By M.P.Billings –PHI, Delhi
5. Geology hand book in civil Engineering –By R.F. Legget- Mc GrawHill, New York,
6. Principles of Engineering Geology& Geotechniques – by D. P. Krynie, W.R. Judd.
7. Engineering & General Geology- by Prabin Singh-S.K. Katariya & son
8. Engineering Properties of rocks By L.W. Farmer-Chapman & Hall, London.
9. Experiments in Engineering Geology –By K.V.G. K. Gokhale and D.M. Rao – TMN, New Delhi.
10. A text book of Engineering Geology –By R. V. Gupte- Pune Vidyarthi Griha Prakashan Pune.
11. Engineering Geology for civil Engineering – By Dr. D.V.Reddy.
12. Engineering Geology –by B.S.Sathynarayan Swami.
13. Groundwater Hydrology\_ By Tood D. K.- John Wiley & Son, New York.
14. Engineering Geology Laboratory Manual.
15. Rutley's Elements of Mineralogy- By H.H. Read –CBS Pub. Delhi.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 16*

### **S.E. (Civil/Environmental) Engineering Part II**

1. STRUCTURAL MECHANICS II

#### **Teaching Schemes: Examination Schemes:**

**Lectures: 3 Hours per week Theory Paper: 100 Marks**

**Tutorial : 1 Hours per week Term Work : 25 Marks**

#### **SECTION I**

##### **Unit 1. (06)**

Combined direct and bending stresses, eccentric load on short columns, kern of a section, eccentricity of load about both axes of section. Chimney subjected to

wind pressure, simple problems on dams and retaining walls.

##### **Unit 2. (04)**

Behaviour of axially loaded long columns - Effective length, Slenderness

ratio. Crippling load by Euler's and Rankine's formula, Limitations.

**Unit 3. (06)**

Principal stresses and strains for 2-D problems- Normal and shear stresses on inclined plane. Principal plane and Principal stresses, Principal strains, Mohr's circle

method, Principal stresses in beams, Stresses trajectories.

**Unit 4. (04)**

Combined bending, torsion and thrust-shaft subjected to simultaneous bending, torsion and thrust. Principal stresses, equivalent torque and equivalent moment for solid circular shaft.

**SECTION II**

**Unit 5. (06)**

Slope and deflection of beam-Computation by Double integration, Mecaulay's Method., Moment area method, Conjugate beam method.

**Unit 6. (05)**

Deflection of determinate beams, bents and trusses by strain energy method, Castigliao's theorem.

**Unit 7. (06)**

Influence line diagrams, Muller-Breslau principle. Application to statically determinate simple and compound beams to determine support reaction, S.F. & B.M.

at any section. I.L.D. for force in members of determinate truss.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 17*

**Unit 8. (06)**

Theories of elastic failures- Maximum principal stress. Maximum Principal strain, Maximum shear stress theories, Total strain energy and distortion energy theory, causes of failure, fatigue and creep.

**TERM WORK**

Term work shall consist of numerical assignments on each unit.

**REFERENCE BOOKS**

9. Mechanics of Structures (Vol I & II) by S.B. Junnarkar, Charator Book.

10. Analysis of Structures (Vol I & II) by Vazirani and Ratwani, Khanna Pub., Delhi

11. Basic Structural Analysis by C. S. Reddy.

12. Elements of Strength of Materials, (5th Edition) by S. Timoshenko and J. Young Affiliated East-West

13. Strength of Materials by F.L. Singer, Harper and Row Pub., New York

14. Introduction to Mechanics of Solids by E.P.Popov. 3rd Ed. (1981), Prentice-Hall of India.

15. Elementary Structural analysis by Norris and Wilbur Mc-Graw Hill, New York.

16. Mechanics of Materials by Gere and Timoshenko, C.B.S. Delhi.

17. Mechanics of Structures by C.R. Shanley.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 18*

## **S.E. (Civil) Part-II**

### **2. SURVEYING II**

#### **Teaching Scheme: Examination Scheme:**

Lectures : 3 Hours /Week Theory Paper : 100 Marks

Practical.: 2 Hours/week Term Work : 25 Marks

Oral : 25 Marks

#### **SECTION-I**

##### **Unit 1 Tacheometry:**

a) Tacheometric constants, basic formulae, field work, auto reduction tacheometer,

tangential system, Subtense method, subtense bar and accuracy (5)

##### **Unit 2 Curve surveying**

a) Horizontal curves: Necessity, Types and Designation. Elements, Design. Linear

and angular Methods of setting out simple circular, compound, reverse and transition

curves (Length of transition curve, Cubic Parabola, Bernoulli's lemniscates) (7)

b) Vertical curves: types, setting out (2)

##### **Unit 3 Project Surveys**

a) General specifications, Reconnaissance, Preliminary and Location survey for

i) Route (Highway, railway, Canal)

ii) Culvert and Bridges

iii) Tunnel, Mine : Centre line transfer, Level transfer, Weisbach triangle

iv) Building (7)

##### **Unit 4 Trilateration and triangulation**

a) Principles, selection of station, signals, satellite station, reduction to center, spherical excess, angular observations, base line measurement and corrections, (3)

b) Triangulation Adjustments: theory of errors, adjustments, laws of weights, least

square method, determination of most probable value (3)

c) Trigonometrical Levelling: Terrestrial refraction, Angular correction for curvature and refraction, Axis signal correction, Determination of difference of

elevation by single observation. (1)

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 19*

### **Unit 5 Photogrammetry**

a) Types – Terrestrial and Aerial Photogrammetry, principles, Phototheodolite, Aerial Camera, vertical aerial photogrammetry :Scale, Relief Displacement, flight planning , Ground control (4)

b) Stereoscopy and photo interpretation: Mirror and Lens stereoscope, Parallax Bar,

Plotting instruments (2)

: 2 :

### **Unit 6 Remote sensing, GIS and GPS**

a) Remote sensing: introduction and principles, electromagnetic energy and spectrum, classification of remote sensing systems, Platform for sensing, types of

data products, introduction to image processing and applications (3)

b) GIS and GPS: introduction and applications (2)

### **Unit 7 Field astronomy**

a) Field astronomy: terms, co-ordinate systems, determination of latitude and true bearing by observation on the sun and pole star (4)

### **TERM WORK**

A) Practicals on Tacheometry

a. Determination of constants of tacheometer

b. Computation of horizontal distance and elevation by Tacheometry for horizontal and inclined sight

c. Study and use of subtense bar

d. Tangential Tacheometry

B) curves

a) Setting Simple circular curve linear methods (Successive bisection, Long Chord, Tangents, Chord Produced Method) .

b) Setting Simple circular curve Angular methods (Rankine's method, Two Theodolite and Tacheometric method)) .

C) photogrammetry

a) Study and use of Mirror stereoscope and finding out Air base distance.

b) Study and use of parallax bar for measuring parallax finding out the difference of elevation of two points

c) To find out the scale of the photograph

d) Radial line method of plotting ( Photo triangulation)

D) Project Work

1) Tacheometric contouring

- 2) Route Survey project
  - 3) Adjustment of geodetic quadrilateral without central station by approximate method and by method of correlates. ( it is desirable to solve the above problem by using computer)
- E) Use of GIS.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 20*

### **RECOMMENDED BOOKS**

- a) Surveying – B. C. Punmia. Vol. II and III, Laxmi Publication, New Delhi
  - b) Surveying and Leveling –T. P. Kanetkar and S. V. Kulkarni Vol. 2, -Pune Vidarthigrih Publication
  - c) Plan and Geodetic Surveying – David Clark
  - d) Advanced Surveying – Agor –Khanna Publishers, Delhi
  - e) Surveying-Bannister and Raymond
  - f) Advanced Surveying –Jawahar Lal Sharma CBS Publishers New Delhi
  - g) Advanced Surveying - K. R. Arora,
  - h) Surveying – S. K. Duggal Vol. 2 Tata McGrahill Publishing Co.New Delhi.
  - i) Introductory Surveying- James R.Wirshing,Roy H.Wirshing,Tata Mchill Delhi.
  - j) Text book of Surveying- C.Venketramaiah. Universities Press (India) Limited,Hydrabad.
  - k) Text book of Surveying II-P.B. Shahani Oxford & IBH Publication Co. Bombay.
- S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 21*

### **S.E. (Civil) Engineering Part II**

#### **3. Building Construction and Design**

##### **Teaching Scheme Examination Scheme:**

Lectures : 3 Hours per week Theory Paper : 100 Marks

Drawing : 2 hours per week ( 4 hours duration)

Practical : 2 hours per week Term work: 25 marks

POE : 50 Marks

##### **Section – I**

##### **Unit1 (4)**

##### **Planning of Residential Building:**

I. Site Selection criteria

II. Principles of BUILDING Planning. SignificanceSun Diagram.Wind Diagram.

III. Orientation, Factor affecting, Criteria under Indian conditions

##### **Unit2 (10)**

I. Building Planning byelaws & regulations as per SP-7, 1983 National building

. Code of India Group 1 to 5.

II. Planning of residential Building (Bungalows, Row Bungalows, Apartments, Twin

Bungalows) Procedure of building permission, Significance of commencement,

Plinth completion or occupancy certificate.

III. Introduction to Modular plan & Optical Design of Building.

### **Unit3 (5)**

I. Low cost Housing-materials & methods (Conceptual introduction only)

II. Maintenance, Repairs, Rehabilitation of structures.(Conceptual introduction only)

### **Section – II**

### **Unit 4 (7)**

#### **Building Services:-**

I. Plumbing Systems, Various materials for system like PVC, GI, AC, CI, HDPE,

Stoneware. Various types of traps, Fittings, Chambers, Ned of septic tank, Concept of plumbing and drainage plan, Introduction to rain water harvesting.

II. Design of rainwater gutters. Rainwater outlet & down take systems.

III. Electrification: - Concealed, & open wiring, Requirements & Locations of Various points, concept of earthing.

### **Unit5 (6)**

I. Ventilation: Definition & necessity of ventilation, functional requirements, Various systems & selection criteria.

II. Air conditioning: purpose, classification, principles, systems & various Components of the same.

III. Thermal insulation: General concept. Principles, materials, methods, Computation of Heat loss & heat gain in buildings.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 22*

### **Unit 6 (6)**

#### **Building Finishes**

I. Paints: Different types & application methods.

II. Varnishes & application methods.

III. Plastering, Pointing & various techniques.

IV. Tiles cladding, skirting, dado work with various materials.

V. Miscellaneous finishes such as POP, sand blasting techniques, wall paper.

Note: - POE will be based on 45 min. drawing exercise & term work carried out.

### **Term Work**

I. Imperial Size sheet based on actual measurement of existing residential building consisting of plan, elevation section passing through staircase, Separate details of foundation, plinth, sill, lintel, roof, site plan. Area statement & brief specifications.

II. Planning & designing of residential building (G+I).

III. Full set of drawings for the building planned in II

a. Submission drawing / Municipal drawing.

b. Water supply and drawing plan.

c. Electricity plan.

d. Furniture layout plan.

IV Project report giving details of various design parameters taking into account in

Preparation of II along with submission pro-forma.

AutoCAD Exercise based on project, (Any one working Drawing).

### **Recommended Books**

1. Building Design and Drawing: Y.S. Sane-Allies Book Stall, Pune

2. Building Design and Drawing : Shaha, Kale & Patki – T.M.H., New Delhi

3. Building Construction : Sushilkumar –standerd Publishers, Delhi

4. Building Construction : N.K.R. Murthy -Allies Book Stall, Pune

5. Building Construction : Arrora and Guptaa – Satya Prakash, New Delhi.

6. The Construction of building Vol.I to V

7. Building Technology: I.Seeley.

8. A Text book of building Construction: Bindra Arora – Dhanpat Rai Publication

9. SP 7 – 1983: National Building code Group 1 to 5 – Indian Standards, Delhi.

10. Planning by E & OE.

11. SP 1650- 1973: Standard code for Building & Decorative finishes- Indian Standards, Delhi.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 23*

### **S.E. (Civil) Engineering Part-II**

#### **4. FLUID MECHANICS – II**

##### **Teaching Scheme Examination Scheme**

Lectures: 3 hrs/week Theory Marks :100 marks

Practical: 2 hr/week Term Work : 25 marks

##### **SECTION – I**

##### **Unit 1 [07 hrs]**

##### **Uniform flow through open channel**

Scope & Importance, Types of open channel, Types of flows in open channel,

Geometric elements, Concepts of Froude's number, Velocity distribution, Kinetic Energy & Momentum correction factors, Measurement of Velocity (Pitot tube, Current Meter, Floats)

Steady & Uniform Flow, Chezy's & Manning's formula, Roughness coefficient, Uniform Flow computations, hydraulically efficient section (Rectangular, Triangular,

Trapezoidal). Problem on uniform flow.

Depth energy relationship in open channel flow, Specific Energy (Definition & Diagram, Critical, Sub-Critical, Super-Critical Flow) Specific Force (Definition & Diagram)

### **Unit 2 [05 hrs]**

#### **Gradually varied flow (G.V.F.)**

Definition, Classification of channels Slopes, Dynamics equation of G.V.F. (Assumption and Derivation), Classification of G.V.F., Profiles-Examples, Direct step

method of Computation of G.V.F. profiles.

### **Unit 3 [04 hrs]**

#### **Rapidly varied flow (R.V.F.)**

Definition, examples-Hydraulic jump-phenomenon, relation of conjugate depth in horizontal- rectangle channel, parameter, uses, type of hydraulic jump, hydraulic jump

as an energy dissipater. Problem on Hydraulic Jump.

### **Unit 4 [04 hrs]**

#### **Notches and weirs**

Types, deviation of discharge equation, velocity due to approach, Francis formula,

Calibration of notch, errors in measurement, Time of emptying tanks by notch.

Weir & Spillway: Sharp, broad & round crested weirs, calibration of weir, Time of emptying tanks by weir, Profile of ogee spillway. Types of nappe. Ventilation of weirs.

## **SECTION – II**

### **Unit 5 [05 hrs]**

#### **Impact of jet**

Impulse momentum principle, Impact of jet on Vanes-flat, Curved (Stationary & moving) inlet & outlet velocity triangles, Series of flat, curved vanes mounted on wheel. Problem on force existed by Jet of flat, curved vanes.

### **Unit 6 [04 hrs]**

#### **Hydraulic turbines:**

Importance of hydro-power, Classification of turbines, description, Typical dimensions and working principle of pelton, Francis & Kaplan turbine (Detailed

design need not be dealt with), Unit quantities, Specific speed, Performance Characteristics, Selection of type of turbine, description & function of Draft tube, *S.E. (Civil Engineering)*

*Solapur University, Solapur-w.e.f. Academic Year 2008-09 24*

types. Thoma's cavitations number, governing of turbine. General layout of Hydraulic plant.

### **Unit 7 [05 hrs]**

#### **Centrifugal pump**

Classification, components, parts, Working of Centrifugal pump, Performance Characteristics, Selection of pump, Common pump troubles & remedies, Introduction

to different types of pumps such as reciprocating, multi-stage, Jet, Air lift, Submersible pump. Problem on centrifugal pump.

### **Unit 8 [06 hrs]**

#### **Dimension analysis & Model Studies**

Dimensions & Dimensional homogeneity, Importance & use of Dimension analysis,

Budeingham's pi theorem-Statement & application, Non-dimensional numbers & their significance

Hydraulic similitude- Importance & use, Geometric, kinematics & dynamics

Similarities, Froude's & Reynolds's model law, Scale ratios, applications, Distorted

models, River models- fixed bed & mobile bed models.

#### **TERM WORK**

1. Any 4 of the following

a. Study of specific energy diagram for different discharges.

b. Calibration of V notch/rectangular notch.

c. Calibration of sharp crested suppressed weir and plotting of upper/lower nappe.

d. Calibration of Ogee Weir.

e. Study of hydraulic jump

i. Verification of sequent depths

ii. Determination of loss in jump

iii. Plotting the following parameters with respect to Froude number

1)  $Y_2/Y_1$  2) Length 3) Energy loss

f. Study of flow over broad crested weir.

g. Study of flow below gates – Discharge vs head relation, Equation of flow, Determination of contraction in flow in downstream of gate.

h. Velocity distribution in open channel in transverse direction of flow.

2. a) Impact of jet.
- b) Study of turbines (demonstration/test).
- c) Test on a centrifugal pump.
- d) Study of charts for selection of pumps.

#### **RECOMMENDED BOOKS**

- 1) Fluid Mechanics – A.K.Jain-Khanna Pub., Delhi.
- 2) Fluid Mechanics – K.L.Kumra – Eurasia Publishing House, Delhi.
- 3) Fluid Mechanics – Streeter McGraw Hill-International Book Co., Auckland.
- 4) Open channel flow – Rangaraju – Tata McGraw Pub.Co., Delhi.
- 5) Fluid Mechanics – K.Subramanyam – Tata McGraw Pub.Co., Delhi.
- 6) Fluid Mechanics – Hydraulic & Hydraulic Mechanics Modi/Seth – Standard Book House, Delhi.
- 7) Flow in open channel – V.T.Chaw – McGraw Hill International Book Co., Auckland.
- 8) Flow in open channel – K.Subramanyam – Tata McGraw Pub.Co., Delhi.

#### **S.E. (Civil) Engineering Part- II**

#### **5. WATER RESOURCES ENGINEERING – I**

##### **Teaching Scheme: Examination Scheme**

Lectures: 3 hrs/week Theory Paper: 100 marks

##### **SECTION-I**

##### **Unit- 01 [5 hrs]**

**Introduction to Hydrology:** Definition, History and importance of hydrology, The hydrological cycle, Weather and its precipitation potential.

**Precipitation** :Forms and types of precipitation, Different methods of measurement,

Factors affecting precipitation at a location, Correcting precipitation data, Estimating

missing data, Estimation of extreme values, Rain gauge network, Determination of

average precipitation over the catchments, Analysis of precipitation data, Mass rainfall curves, Intensity-duration curves, Concept of depth-area- duration analysis,

Frequency analysis.

**Evaporation and Evapotranspiration:** Factor affecting evaporation, Measurement

and control of evaporation upon reservoirs. Evapotranspiration - definition and measurement

**Infiltration:** Process of Infiltration, Factor affecting infiltration, Infiltration indices, Effect of infiltration of on runoff and ground water recharge.

**Unit 02 [5 hrs]**

**Runoff:** Factors affecting runoff, Catchment yield calculations, Rainfall-runoff relationship

**Hydrograph:** Base flow, Separation of base flow, Unit hydrograph – theory, assumptions and limitations, Derivation and use of unit hydrograph, S-curve hydrograph.

**Unit 03 [5 hrs]**

**Stream gauging:** Selection of site, various methods of discharge measurements, Area

velocity method, Area Slope method, S.W.F., other modern methods.

**Floods:** Definition, Factors affecting, Estimation of peak flow, Rational and other methods, Design flood hydrograph components, Recurrence period.

**Unit 04 [5 hrs]**

**Ground water hydrology:** Occurrence and distribution of ground water, Specific yield of aquifers, movements of ground water, Darcy's law, Permeability, Safe yield

of basin,.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 26*

Hydraulics of well under steady flow condition in confined and unconfined aquifers, Specific capacity of a well, Well irrigation: tube wells, open wells, their design and construction.

**SECTION-II**

**Unit 05 [6 hrs]**

**Introduction:** Definition and necessity of Irrigation, Different systems of irrigation-

Flow, Lift, Inundation, Bandhara, Storage, Kolhapur type weirs, Sources of water, river,

well, tanks.

**Inter basin transfer of water:** Development of irrigation potential in India and Maharashtra, Concept of inter basin transfer of water, Proposed inter basin transfer of

water from surplus regions of India to deficit regions of India, National perspective

plan of India-Himalayan rivers component and peninsular rivers component.

**Crop Water requirements:** Cash crops and food crops, Water requirement of different crops, Duty and Delta, Factors affecting duty and delta, Crop Seasons in Maharashtra and India, Command Area-Gross, Culturable, Irrigable, Calculation of

water required.

Unit 06 [5 hrs]

**Soils:** Types of Soils, Suitability of soils for different crops, Soil moisture, Wilting coefficient, Texture and physical structure, Harmful components in soil, Preparation

of soil for irrigation (All above from agronomical point of view)

**Water Application Methods:** Methods of lifting water and application of water to soils, Sprinkler, Drip, Basin, Furrow, Elementary design of Drip Irrigation System

Unit 07 [4 hrs]

**Minor Irrigation System:** Necessity and general layout of percolation tanks, Bandhara irrigation.

**Lift Irrigation:** Necessity, General Layout, Main Components and Simple Design of

a lift irrigation scheme.

Unit 08 [5 hrs]

**Water Management:** Application of water, Water management and distribution, cooperative water users' organizations, Warabandi, Rotational applications, Assessment of canal revenue-Variou s methods

**Watershed Management:** Need of Watershed management, Importance of soil conservation measures, Rainwater management, Water Catchment and water harvesting, Techniques for Rainwater harvesting and ground water harvesting.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 27*

### **TEXT BOOKS**

- Irrigation Engineering and Hydraulic Structures-S. K. Garg, Khanna Publishers, Delhi.
- Irrigation and water power Engg.- Dr. Punmia, Dr. Pande, Laxmi Publications.
- Engineering hydrology- K.Subramanyam , Tata McGraw- Hill Publishers.
- Efficient Use of Irrigation Water-G.H.Sankara Reddi , Kalyani Publishers, Noida.

Water Management in India-J.V.S.Murthy.

- Water Management, Conservation, Harvesting and Artificial Recharge- Dr.A.S.Patel, Dr.D.L.Shah, New Age International Publishers.
- Hydrology and Water Resources-R.K.Sharma, Dhanpat Rai & Sons.
- Fundamentals of Irrigation Engg.-Bharat Sing, Nem Chand & Bros, Roorkee.

### **REFERENCE BOOKS**

- Irrigation theory & Practice – Michael. Vikas Publishing House.
- Irrigation Structures- Milos Holy-CBIP
- Water Management-Jaspal Singh, M. S. Acharya , Arun Sharma .Pub-Himanshu Publication

- Design of Minor Irrigation and Canal Structure- Satyanarayan and R.Murthy.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 28*

## **S.E. ( Civil ) Engineering Part II**

### **6. CONCRETE TECHNOLOGY**

Teaching Scheme : Examination Scheme :

Lecturer : 2 Hours per week Theory Paper : 50 marks

Practical : 2 hours per week Term work : 25 marks

#### **Unit No.1: (4)**

a) Cement- Hot and dry manufacturing process , significance of physical properties of

cement such as fineness, consistency test, initial & final setting time, soundness, compressive strength, specific gravity. Hydration of cement, chemical compounds in

cement & their properties. Types of cement- ordinary Portland, Portland pozzolana ,

rapid hardening Portland cement, quick setting cement sulphur resisting cement, high

alumina, low heat, white, coloured, oil well, hydrophobic cement.

b) Aggregate : physical properties such as sieve analysis & fineness modulus, specific

gravity & water absorption, silt content , bulking of sand, bulk density, moisture content, flakiness index, elongation index, Angularity Number. Mechanical properties

such as crushing, impact & abrasion value.

c) Water :- Specifications of water to be used for concrete making.

#### **Unit No 2: (4)**

Properties of fresh concrete – Types of batching, mixing, transportation, placing including pumping & compaction techniques for good quality concrete, workability of

concrete & its measurements, segregation & bleeding, curing of concrete, different

methods of measuring workability, temperature effects on fresh concrete.

#### **Unit No 3: (2)**

Admixtures in concrete & construction chemical – Types of admixtures, plasticizers

& superplasticizers & their effects on workability, air entraining agents, accelerators

retarders, their effects on proportion of concrete, pozzolanic admixtures, binding

admixtures, damp proofing admixtures, construction chemical.

**Unit No 4: (2)**

Desired properties of concrete, strength, durability & impermeability, Characteristic strength, compressive strength, tensile & flexure of concrete, tests on concrete, modulus of elasticity, effect of w/c ratio & admixture on strength properties of concrete . Concrete mixes for different strength as per IS-456-2000, high strength & high performance concrete.

**Unit No 5: (2)**

Creep and shrinkage of concrete , significance, types of shrinkage and their control , factors affecting creep.

**Unit No 6: (4)**

Design Mix Concrete , nominal Mix Concrete, objectives of mix design, factors governing mix design, methods of expressing proportions ACI method, IS code method, road Note No.4 method, trial mixes, Acceptance criteria.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 29*

**Unit No 7: (4)**

Durability of concrete : Minimum & Maximum cement content, strength & durability relationship, volume change in concrete , impact of w/c ratio on durability, permeability, Exposure to different conditions, factors contributing to crack in concrete , sulphate attack, Alkali aggregate reaction, chloride attack , corrosion of steel (chloride induced )

**Unit No 8: (4)**

Type of concrete : light weight concrete , polymer concrete , gap graded concrete, no fines concrete,plum concrete , high performance concrete . Quality control of concrete  
– Factors causing variations, field control , statical quality control , quality measurement in concrete construction.

**TERM WORK**

**Experiment:**

**Testing of cement**

Consistency, fineness, setting time, Specific Gravity, soundness and strength.

**Testing of aggregate**

Specific Gravity, sieve analysis, bulking of fine aggregate, bulk density, flakiness

index, elongation index and percentage elongation.

**Test on Concrete :**

Workability test- Slump , compaction, Vee-bee, strength test – compression, flexure, split & tensile.

.

**Concrete Mix design**

Experimental

**REFERENCE BOOKS:**

- a. Concrete Technology by Orchard
- b. Concrete Technology by Gambhir
- c. Concrete Technology by Shetty
- d. Concrete Technology by Neille.
- e. Concrete Technology by Krishnaswamy.
- f. I.S.456-1978 Code
- g. I.S. 9013- 1978 Accelerated curing.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 30*

**S.E. (Civil) Engineering Part- II**

**7. COMPUTER PROGRAMMING AND NUMERICAL METHODS**

**Teaching Scheme: Examination Scheme**

Lectures: 1 hr/week Term Work : 50 marks

Practical: 2 hrs/week Practical-Oral : 25 marks

Tutorial : 1 hr/week

**Unit 1 [8 hrs]**

Revision of C Programming concepts-Decision control structure, Loop control structure, Case control structure, Functions and Arrays in C.

**Unit 2 [4 hrs]**

Matrix operations on computer: Multiplication and inversion, Gauss elimination method, Solution of simultaneous equations

**Unit 3 [3 hrs]**

Roots of equation : .Newton Raphson method, Trial and error method, Bisection method.

**Unit 4 [3 hrs]**

Numerical intergration by Simpsons rule and Trapezoidal rule.

**Unit 5 [4 hrs]**

Solution of ordinary differential equation: Euler's Method, Modified Euler's method.

Runga Kutta method.

#### **Unit 6 [4 hrs]**

Statistical analysis: Mean and standard deviation, Least square method, Regression

analysis – Linear, parabolic curve fitting

#### **TERM WORK**

Term work shall consist of at least 12 programs with flow charts, source listing, input and outputs based on above topic. Programming has to be done in 'C'

language.

#### **NOTE**

All the units described above are to be taught with computer applications based on civil engineering problems.

*S.E.(Civil Engineering)*

*Solapur University, Solapur-w.e.f.Academic Year 2008-09 31*

#### **RECOMMENDED BOOKS**

- (1) Numerical Methods: E. Balagurusamy, Tata Mc-Graw Hill Publications.
- (2) Computer Programming and Numerical methods- Revised edition with CN. Datta
- (3) Numerical Methods for Scientific and Engineering Computation-M.K.Jain, S.R.K.Iyengar, R.K.Jain- New Age International Publishers.
- (4) Numerical Methods- S.Arumugam, A.Tthangapandi Isaac, A. Somasundaram, Scitech Pubishers
- (5) Numerical Methods- Grewal, Khanna Publishers.
- (6) Let us C-Yashawant Kanetkar,BPB Publications New Delhi
- (7) Programming with C-Schaum Outline Series, Tata-McGraw Hill Publishers.