

**NORTH MAHARASHTRA  
UNIVERSITY,  
JALGAON (M.S.)  
Second Year Engineering  
(CIVIL)**

**Faculty of Engineering and Technology**



**Teacher and Examiner's Manual**

**SEMESTER – III**

**W.E.F 2013 – 2014**



## ENGINEERING MATHEMATICS III

Teacher, Paper setter and Examiners should follow the guidelines as given below.

### Unit – I

Teacher should facilitate learning the Solution of nth order Linear Differential Equations, Application to Linear Differential equation to electrical circuits.

1.	Linear Differential Equations	Lectures required	Reference
	a Introduction to nth order Linear Differential Equation, Auxiliary Equation , Complimentary Functions	02	2,6
	b Solution of nth order L.D.E using General Method	01	2,6
	c Particular Integral using short cut methods	02	2,6
	d Solution of 2 <sup>nd</sup> order L.D.E using Variation of Parameter Method	01	2,6
	e Solution of Cauchy's D.E	01	2,6
	f Solution of Legendre's D.E	01	2,6

### Unit - II

1. Teacher should facilitate learning of Application of D.E. to strut, bending of beam, columns, Introduction to one dimensional heat flow equation and its solution using method of separation of variables; Introduction to two dimensional heat flow equation and its solution using method of separation of variables

2.	Applications of Linear Differential Equations and Partial Differential equations	Lectures required
	a Applications of linear differential equations to strut, bending of beams, columns.	02
	b Introduction to one dimensional heat flow equation and its solution using method of separation of variables	03
	c Introduction to two dimensional heat flow equation and its solution using method of separation of variables	03

### Unit - III

Teacher should facilitate learning of basics of Moments, Skewness, Kurtosis, Correlation and Regression, Probability distributions

1.	Statistics and Probability distributions	Lecture required	Reference
	a Introduction to mean, mode, median, standard deviation, variance, coefficient of variation	01	1,5
	b Moments, Skewness and Kurtosis	02	1,5
	c Correlation and Regression	02	1,5
	d Binominal Distribution	01	1,5
	e Poisson Distribution	01	1,5
	f Normal Distribution	01	1,5

**Unit – IV**

Teacher should facilitate learning of basics of testing of hypothesis and significance

1.	Testing of Hypothesis and significance	Lecture required	Reference
a	Introduction to population parameters and statistics	01	1,5
b	Testing of hypothesis, null hypothesis, alternative hypothesis, level of significance	01	1,5
c	Test of significance of large sample	04	1,5
d	Chi-square test	01	1,5
e	t-test	01	1,5

**Unit – V**

Teacher should facilitate learning of basics of testing of hypothesis and significance

1.	Vector Differentiation	Lecture required	Reference
a	Gradient of scalar point function	01	1,5
b	Directional derivatives of scalar point function	02	1,5
c	Divergence and Curl vector field	03	1,5
d	Solenoidal and irrotational vector fields.	01	1,5
e	Applications to Bernoulli's equation	01	1,5

**Reference Books:**

1. H.K. Dass - Advanced Engineering Mathematics (S. Chand Publication) New Delhi.
2. Erwin Kreyszig - Advanced Engineering Mathematics (Wiley Eastern Ltd.).
3. B.S. Grewal - Higher Engineering Mathematics, Khanna Publication, Delhi.
4. Wylie C.R. & Barrett - Advanced Engineering Mathematics - McGraw Hill.
5. B.V. Ramana - Engineering Mathematics - Tata Mc- Graw – Hill.
6. A Text Book of Engineering Mathematics, By N. P. Bali, Laxmi Publication.

# STRENGTH OF MATERIALS

Teacher, paper setter and examiner should follow the guidelines as given below.

## Unit - I

Teacher should facilitate learning of basic of stresses, strains, deformation of bars, temperature stresses.

1. Simple Stresses and Strains		Lecture required	Reference No
a	<b>Types of Stresses</b> Normal stress and strain, tensile, compressive and shear stresses , hooke's law.(Numerical expected)	2	1 & 2
b	<b>Deformation of bars</b> Deformation in prismatic, stepped, & composite members due to concentrated load & self-weight. (Numerical & derivation expected)	2	1 & 2
c	Stress & strain in determinate and indeterminate members (Numerical expected)	2	1 & 2
d	Temperature stresses. (Numerical expected)	3	1 & 2

## Unit – II

Teacher should facilitate learning of concept of shear stress and strain, relation between elastic constants, strain energy.

2. A. Shear stress and strain, Elastic Constants		Lecture required	Reference No
a	Shear stress & strain, modulus of rigidity, Poisson's ratio, bulk modulus. (Numerical expected)	2	1 & 2
b	Relation between E, G & K, generalized Hooke's law, stress strain diagram, working stress, factor of safety. (Numerical & derivation expected)	2	1 & 2
<b>B. Strain Energy</b>			
c	Strain energy, stresses due to various types of axial load using strain energy method. (Numerical & derivation expected)	3	1 & 2

## Unit – III

Teacher should facilitate learning of concept of shear force & bending moment, bending stresses in beams.

3. A. Shear Force & Bending Moment		Lecture required	Reference No
a	Concept of shear force and bending moment	1	1 & 3
b	Shear force & bending moment diagrams for cantilevers, simple and compound beams due to concentrated, uniformly distributed loads. (Numerical expected)	1	1 & 3
c	Shear force & bending moment diagrams for cantilevers,	1	1 & 3

	simple and compound beams due to uniformly varying load and couples. <b>(Numerical expected)</b>		
d	Construction of loading diagrams and bending moment diagram from shear force diagram. <b>(Numerical expected)</b>	1	1 & 3
<b>B. Bending Stresses in beams</b>			
e	Introduction to moment of inertia, parallel and perpendicular axis theorem.	1	1 & 2
f	Theory of simple and pure bending, section modulus, moment of resistance. <b>(Numerical &amp; derivation expected)</b>	1	1 & 2
g	Bending stress distribution diagram for beams. <b>(Numerical expected)</b>	2	1 & 2

#### Unit – IV

Teacher should facilitate learning of concept of shear stresses in beams, torsion and axially loaded columns.

4.	A. Shear Stresses in beams	Lecture required	Reference No
a	Shear stresses in beams, shear stress derivation	1	1 & 2
b	Shear stress distribution in different cross sections of beams. <b>(Numerical expected)</b>	1	1 & 2
<b>B. Theory of pure torsion</b>			
c	Theory of pure torsion, torsional moment of resistance, power transmitted by shafts. <b>(Numerical expected)</b>	1	1 & 2
d	Torsional rigidity, shear stresses in shafts due to torsion. <b>(Numerical expected)</b>	1	1 & 2
e	Stress & strain in determinate shafts of hollow or solid cross-sections. <b>(Numerical expected)</b>	1	1 & 2
<b>C. Axially loaded columns</b>			
f	Axially loaded columns: Euler's theory of long columns, Assumptions made in Euler's theory, limitations of Euler's formula. <b>(Numerical expected)</b>	1	1 & 2
g	Various end conditions & concept of equivalent length. <b>(Numerical &amp; derivation expected)</b>	1	1 & 2
h	Rankine's formula. <b>(Numerical expected)</b>	1	1 & 2

#### Unit - V

Teacher should facilitate learning of direct and bending stresses, principal stresses and strains.

5.	A. Direct and Bending Stresses	Lecture required	Reference No
a	Direct & bending stresses in short columns & other structural components due to eccentric or lateral loads. <b>(Numerical expected)</b>	2	1 & 2
b	The Middle third rule, Core of section. <b>(Numerical expected)</b>	1	1 & 2
<b>B. Principal Stresses and Strains</b>			
c	Principal stresses & strain: Concept of principal stresses and	1	1 & 2

	planes.		
d	Normal and tangential stress on any oblique plane. <b>(Numerical &amp; derivation expected)</b>	1	1 & 2
e	Determination of principal stresses and principal planes. <b>(Numerical &amp; derivation expected)</b>	1	1 & 2
f	Mohr's circle method. <b>(Numerical expected)</b>	1	1 & 2

**REFERENCE BOOKS:-**

1. M. Passi, Strength of material, Tech-max Publications, Pune.
2. S. Rammurthum – Strength of material, Dhanpat Rai & Sons.
3. S.S.Ratan- Strength of materials, Tata McGraw Hill
4. D. S. Prakash Rao- Strength of material, University Press
5. V.L. Shah and R.A. Ogale, Strength of Materials & Machine Elements, Structures Publications, Pune.
6. E.P.Popov - Mechanics of Solids
7. Timoshenko - Strength of Materials
8. A.S. Basu – Strength of Material, Dhanpat Rai & Sons.

# CONCRETE TECHNOLOGY

Teacher, paper setter and examiner should follow the guidelines as given below.

## Unit - I

Teacher should facilitate learning of cement, aggregate and there various types

1.	Introduction to cement, aggregate, sand, water	Lecture required	Reference No
a	Cement ,its chemical composition and manufacturing process	01	01,02
b	Types of cement Ordinary portland cement, rapid hardening, sulphate resisting, quick setting low heat, portland pozzolona air-entraining cement.	02	01,02
c	Properties of cement Setting time of cement and hydration of cement, testing of cement.	01	01,02
d	Aggregate classification and properties.	02	01,02
e	Testing of aggregate and its effect on strength of concrete	01	01,02
e	Quality of water for concrete.	01	01,02

## Unit – II

Teacher should facilitate learning of introduction to concrete and it's properties

2.	Introduction to fresh concrete & hardened concrete	Lecture required	Reference No
a	Fresh concrete there ingredients' grade of concrete	01	01,02
b	Concreting process	01	01,02,03
b	W/C ratio, properties of fresh concrete.	01	01,02
c	Various properties of hardened concrete	01	01,02
d	Stress-strain relationship and micro cracking	01	01,02
e	Testing of hardened concrete	01	01,02,03
f	Creep, shrinkage of concrete	01	01, 02
g	Quality control during concreting	01	01,02

## Unit – III

Teacher should facilitate learning of admixture and types of concrete.

3.	Introduction to admixture and its effects on properties of concrete	Lecture required	Reference No
a	<b>Admixture</b> Types of admixture and its properties.	02	01,02
b	<b>Types of concrete</b> Light weight, polymer and fiber reinforced Ready-mix concrete. Self compacting and high performance concrete.	03	01,03
c	<b>Special concrete-</b>	03	01,02



	Transparent concrete, cellular light wt. concrete, pre-stressed concrete, under water concreting, concreting in extreme weather conditions.		
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#### Unit – IV

Teacher should facilitate learning of methods of concrete mix design.

4.	Concrete mix design, scaffolding and shoring	Lecture required	Reference No
a	<b>Introduction-</b> object of mix design, factors to be considered, statistical quality control, introduction to different methods of mix design	03	01,05
b	Concrete mix design by I.S. (10262-456) method and IRC method.	03	01,02
c	Scaffolding, shoring, under pinning and strutting, types, purposes and precautions.	02	06,03

#### Unit - V

Teacher should facilitate learning of various non destructive tests on concrete

5.	Introduction to non destructive tests on concrete	Lecture required	Reference No
a	Rebound hammer test, ultrasonic pulse velocity, pull out test, impact echo test	03	01,04
b	Deterioration of concrete, permeability, durability, chemical attack.	02	02,
c	Carbonation of concrete, corrosion of reinforcement.	02	06,02

#### Reference Books:

1. Concrete Technology by M.S.Shetty, S Chand Publication.
2. Concrete Technology by M. L. Gambhir, TMH Publication.
3. Concrete Technology by S.V.Deodhar, Central Techno Publication.
4. Concrete Technology by N.V. Nayak & A.K. Jain, Narosa Publishing House Pvt. Ltd.
5. Concrete Technology by A.N. Neville, J.J. Brooks, Addition Wesley
6. Concrete Technology by R.S. Varshney, Oxford & I B H.

# BUILDING CONSTRUCTION TECHNIQUE AND MATERIAL

Teacher, paper setter and examiner should follow the guidelines as given below.

## Unit – I

Teacher should facilitate learning of various types of building and foundation, components of building structures, different foundation and their suitability

1.	<b>Introduction to Types of building and foundation</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Types of building, load bearing, framed structure, steel structure, timber structure, composite structure	02	01,02,03, 04
b	Various parts of building, sub structure and super structure. Plinth, sill, floor, and roof level, plinth height, plinth protection, cornice, coping and their function.	03	01,02
c	<b>Foundation</b> Purpose and classification, advantages and disadvantages, Suitability for each type of foundation, factor considered for selection of foundation	02	01,02 04
d	Factor considered for selection of foundation	01	

## Unit – II

Teacher should facilitate learning of masonry, various material required, methods of construction, form work, materials of formwork

2.	<b>Introduction to Masonry and form work</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Principle of masonry construction, types of masonry	01	01,02, 03, 04
b	Types of wall (load bearing, partition, timber partition, glass partition etc.)	02	01,02, 03, 04
c	Types of bond in brick masonry, reinforced brick masonry, precautions to be taken in masonry construction, composite masonry, solid and hollow blocks used for masonry, cavity wall, etc.	03	01,02, 03, 04
d	Formwork: function of form work, form erection, oiling and stripping	01	01,02, 03, 04
e	Requirements of form and form work, material used for form work.	01	01,02, 03, 04

## Unit – III

Teacher should facilitate learning of definition of lintel, material for casting lintels, location, purposes etc. provision of doors & windows, and concept of circulation.

3.	<b>Introduction to Study of lintel doors &amp; windows, circulation</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Types of lintel, detailing of R.C.C. lintel, precast lintel and stone lintel		01	01,02, 03, 04
b	Doors and windows: Types and suitability, minimum area of window opening for different climatic conditions		02	01,02, 03, 04
c	Various material used for doors and window, fixtures and fastening used. I.S. notations for doors and windows		01	01,02, 03, 04
d	<b>Circulation</b> Horizontal and vertical, stair and staircase planning and design, types of staircase as per shape and material used, type of circulation		01	01,02, 03, 04
e	<b>Floor and Roof</b> Ground floor, upper floor, mezzanine floor, design and constructional requirements,		02	01,02, 03, 04
f	Types of floor finishes used, advantage and disadvantages, special flooring.		01	01,02, 03, 04

#### Unit – IV

Teacher should facilitate learning of steel structures (truss) and its types, R.C.C. framed structure with all details.

4.	<b>Introduction to Truss and its type, R.C.C. framed structure</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Types of steel trusses, methods of connections and their connecting materials.		02	01,02,03, 04
b	Scaffolding, shoring, under pinning and strutting, types, purposes and precautions		03	01,02,03, 04
c	R.C.C. framed structure, column, beam, footing, slab and their connections, general requirements and details.		03	01,02,03, 04

#### Unit - V

Teacher should facilitate learning of various material used in construction, there selection criteria and properties

5.	<b>Introduction to various material used in construction</b>		<b>Lecture required</b>	<b>Reference No</b>
a	<b>Stone</b> Natural bed of stone, stone quarrying, uses of stones, qualities of good building stone, test on stone, preservation of stone.		02	05
b	<b>Bricks</b> Composition of good brick earth, classification of burnt brick, manufacturing of bricks, qualities of good bricks, test on bricks.		02	02,04
c	<b>Timber</b> Properties and uses, testing, conversion and sawing, defects in timbers, artificial		01	05
d	<b>Other miscellaneous material</b>		02	05

	Aluminum, glass, heat insulating material, sound absorbent material.		
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**Reference Books:**

1. Building Construction by Rangwala- Published by Charotar Publishing House ISBN-13 9789380358482, ISBN-10 9380358482.
2. Building Construction by Sushil Kumar- Published by Standard Publishers Distributors, Publication Year 2010, ISBN-13 9788180141683, ISBN-10 8180141683, Edition 19.
3. Building Construction by S.P. Bindra, S.P. Arora, Published by Dhanpat Rai Publications, Publication Year 2010, ISBN-13 9788189928803, ISBN-10 8189928805.
4. Building Construction by Ashok Kr. Jain, B. C. Punmia, Arun Kr. Jain, Published by Laxmi Publications, Publication Year 2009, ISBN-13 9788131804285, ISBN-10 8131804283, Edition 10thEdition.
5. Engineering Materials by Rangwala, Publisher Charotar Publishing House, Publication Year 2011, ISBN-13 9789380358260, ISBN-10 9380358261
6. Civil Engineering Material by Dr. S.V. Deodhar

## SURVEYING-I

Teacher, paper setter and examiner should follow the guidelines as given below.

### Unit - I

Teacher should facilitate learning of surveying and levelling

1.	<b>Surveying &amp; Levelling</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Surveying- Definition, principle of surveying, various types of surveying.	1	1 & 2
b	Bench mark and its types, reduced level, rise and fall method, height of instrument method.	2	1 & 2
c	Instruments used in leveling, dumpy level, automatic level, types of leveling staves.	2	1 & 2
d	Principal axes of dumpy level, reciprocal levelling curvature and refraction correction distance to the visible horizon.	2	1 & 2
e	Profile levelling: L - section and cross -sections.	1	1 & 2

### Unit – II

Teacher should facilitate learning of theodolite

2.	<b>Theodolite</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Principal axes and temporary adjustments of transit theodolite.	2	1 & 2
b	Uses of theodolite: measurement of horizontal angles, vertical Angles, magnetic bearings, measuring deflection angles.	2	1 & 2
c	Theodolite Traversing: Computation of consecutive and independent co-ordinates	2	1 & 2
d	Adjustments of closed traverse, Gales traverse by co-ordinate method	2	1 & 2

### Unit – III

Teacher should facilitate learning Tacheometry

3.	<b>Tachometry</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Principle of stadia method, fixed hair method	3	1
b	Tachometry in surveying, Contour, Characteristics and uses.	3	1
c	Methods of interpolation. Tachometric contour survey	2	1

### Unit – IV

Teacher should facilitate learning of curve

4.	Curves	Lecture required	Reference No
a	Horizontal and vertical curves and their purposes.	2	1 & 2 &3
b	Simple circular curves - Elements and setting out by linear & angular methods	2	1 & 2 &3
c	Compound curves -Elements and setting out of compound curves	2	1 & 2 &3
	Transition curves -types and uses, length of transition curves	2	1 & 2 &3

#### Unit - V

Teacher should facilitate learning plane table survey

5.	Plane Table Survey	Lecture required	Reference No
a	Objective and equipment required for plane table survey.	1	1 & 2
b	Methods of plane tabling - radiation, intersection, traversing and resection.	2	1 & 2
c	Advantages, disadvantages, limitations and errors of plane Table surveying.	2	1 & 2
d	Minor Instruments: Study and use of abney level, box sextant, digital planimeter.	2	1 & 2

#### Reference Books:

1. Surveying and leveling (vol-I&II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. I and Vol .II by B.C.Punmia, Laxmi Publication (P) New Delhi.
3. Principles of surveying by Cliver and clendening
4. Advance surveying , Vol.I & II, Handbook by P.B. Shahani
5. A handbook of accurate surveying methods by S.P.Collins

## SOFT SKILLS – III

Teacher, paper setter and examiners should follow the guidelines as given below.

### Unit - I

Teacher should facilitate the learning basic foundation of mathematics.

1.	Arithmetic-1	Lecture required	Reference No
a	<b>Number Systems</b> Basic Formulae, divisibility rules, speed maths, remainder theorem, different types of numbers, applications	01	01
b	<b>HCF, LCM and Linear Equations</b> HCF – Successive division and prime factorization methods, LCM – Successive division and prime factorization methods, applications, linear equations –elimination method, substitution method, applications	01	01
c	<b>Averages and Mixtures</b> Concept of average, faster ways of finding it, the allegation method, applications	01	01

### Unit II

Teacher should facilitate the learning basic foundation of mathematics.

2.	Arithmetic-2	Lecture required	Reference No
a	<b>Percentages</b> Concept of percentage, working with percentages Applications	01	01
b	<b>Profit and Loss</b> Difference between cost and selling price, concept of profit percentage and loss percentage, applications	01	01
c	<b>Time and Work</b> Basic time and work formula, relation between time and work, applications	01	01

### Unit III

Teacher should facilitate the learning basic foundation of mathematics.

3.	Arithmetic-3	Lecture required	Reference No
a	<b>Permutations and Combinations</b> Sum Rule of disjoint counting, product rule of counting concept of factorial, permutations, linear permutations, combinations, circular permutations, applications.	01	01
b	<b>Probability</b> Definition and laws of probability, mutually exclusive events,	01	01

		independent events, equally likely events, exhaustive events, cards, dice, applications		
	c	<b>Time and Distance</b> Speed, conversion factors for speed, average speed, moving bodies – passing, crossing and overtaking, relative speed, boats and streams, applications	01	01

#### Unit IV

Teacher should facilitate learning of critical thinking.

4.	Non-Verbal Reasoning		Lecture required	Reference No
	a	<b>Analogies</b> Different type of examples of analogies and its Applications	01	02
	b	<b>Classification</b> Different type of examples of analogies and its Applications	01	02
	c	<b>Sequences</b> Different type of examples of analogies and its Applications		02

#### Unit V

Teacher should facilitate the learning of a deep sense of analysis towards solving a problem

5.	Analytical Reasoning		Lecture required	Reference No
	a	<b>Analytical Puzzles</b> Classification puzzles, ordering puzzles, assignment puzzles, applications	01	03
	b	<b>Letter and Number Series</b> Different types of letter series, different types of number series, mixed series	01	03
	c	<b>Coding and Decoding</b> Letter coding, number coding, mixed coding, odd man out, applications	01	03

#### Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S. Chand Publication, New Delhi, 2012.
2. R. S. Aggarwal, "A Modern Approach to Verbal Reasoning", S. Chand Publication, New Delhi, 2012.
3. R. S. Aggarwal, "A Modern Approach to Non-Verbal Reasoning", S. Chand Publication, New Delhi, 2012.



## STRENGTH OF MATERIALS LAB

Teacher should facilitate learning of following lab experiments

Sr No.	Group A Practical exercise- Any five from list given below	No. of lab hours required
1.	<p><b>To determine Tensile test on a metal.</b></p> <p>Conduct a tensile test on a mild steel specimen and determine the following:                      (i) Limit of proportionality (ii) Elastic limit (iii) Yield strength (iv) Ultimate strength.(v) Young’s modulus of elasticity (vi) Percentage elongation (vii) Percentage reduction in area.</p>	2
2.	<p><b>To conduct hardness test on mild steel or aluminum specimens. (Brinell or Rockwell method)</b></p> <p>Determine hardness of steel or aluminium by any one method.</p>	2
3.	<p><b>Torsion test on mild steel rod</b></p> <p>Conduct torsion test on mild steel specimens to find out modulus of rigidity.</p>	2
4.	<p><b>To determine impact strength of steel (Izod test)</b></p> <p>Determine the impact strength of steel by Izod impact test on a sample of steel specimen of size 75 mm X 10mm X 10mm.</p>	2
5.	<p><b>To determine impact strength of steel. (Charpy test)</b></p> <p>Determine the impact strength of steel by Charpy impact test on a sample of steel specimen of size 10 mm X 10mm X 55mm.</p>	2
6.	<p><b>To determine young’s modulus of elasticity of material of beam simply supported at ends.</b></p> <p>Find the values of bending stresses and young’s modulus of elasticity of the material of a beam simply supported at the ends and carrying a concentrated load at the centre.</p>	2
7.	<p><b>To determined Shear Test of Steel.</b></p> <p>Conduct shear test on specimens using Universal testing machine.</p>	2
<b>Group B</b>		
1.	<p><b>Assignment 1</b></p> <p>a. Student should solve numerical based on normal stress and strain, tensile, compressive and shear stresses hooke’s law.                      b. student should solve problems based on deformation in prismatic, stepped, &amp; composite members due to concentrated load &amp; self-weight, stress &amp; strain in determinate and indeterminate members, temperature stresses.</p>	2
2.	<p><b>Assignment 2</b></p> <p>a. Student should solve numerical based on shear stress &amp; strain, modulus of rigidity, poisson’s ratio, bulk modulus, generalized hooke’s law, stress strain diagram.                      b. Student should solve numerical based on strain energy, stresses due to various types of axial load using strain energy method.</p>	2
3.	<p><b>Assignment 3</b></p> <p>a. Student should solve problems based on shear force and</p>	2

	bending moment for cantilevers, simple and compound beams due to concentrated, uniformly distributed, uniformly varying load and couples. b. Student should solve problems based on construction of loading diagrams and bending moment diagram from shear force diagram.	
4.	<b>Assignment 4</b> a. Student should solve numerical based on shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams. b. Student should solve numerical based on shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams.	2
5.	<b>Assignment 5</b> a. Student should solve numerical based on shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams. b. Student should solve problems based on theory of pure torsion, torsional moment of resistance, power transmitted by shafts, torsional rigidity, shear stresses in shafts due to torsion, stress & strain in determinate shafts of hollow or solid cross-sections.	2
6.	<b>Assignment 6</b> a. Student should solve problems based on axially loaded columns: Euler's theory of long columns, Rankine's formula. b. Student should solve problems based on direct & bending stresses in short columns & other structural components due to eccentric or lateral loads, the middle third rule, core of section. c. Student should solve problems based on principal stresses & strain, normal and tangential stress on any oblique plane, determination of principal stresses and principal planes, Mohr's circle method.	2

**Guide lines for ICA:**

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

**REFERENCE BOOKS:-**

1. Strength of material by M. Passi, Tech-max Publications, Pune.
2. Strength of material by S. Rammurthum, Dhanpat Rai & Sons.
3. Strength of materials by S.S.Ratan, Tata McGraw Hill
4. Strength of material by D. S. Prakash Rao, University Press
5. Strength of Materials & Machine Elements by V.L. Shah and R.A. Ogale, Structures Publications, Pune.
6. Mechanics of Solids by E.P. Popov
7. Strength of Materials by Timoshenko.
8. Strength of Material by A.S. Basu, Dhanpat Rai & Sons.

# CONCRETE TECHNOLOGY LAB

## Lab course content

Teacher should facilitate learning following lab experiments.

Sr.	List of experiments	Lab hours required
1	To calculate fineness of cement given as per IS	02
2	To determine consistency of cement	
3	To determine initial and final setting time of cement per IS	02
4	To calculate compressive strength s of cement given as per IS	
5	To calculate soundness of cement given as per IS	02
6	To determine sieve analysis fineness modulus	02
7	To calculate crushing value of aggregates as per IS	02
8	Impact value of aggregate.	02
9	To calculate moisture content of aggregates as per IS	02
10	To calculate abrasive value of aggregates as per IS	02
11	To calculate flakiness and elongation index of aggregates as per IS	02
12	To calculate specific gravity of aggregates as per IS	02
13	Calculate workability of concrete by slump cone and compaction factor method	02
14	To calculate compressive strength of concrete cubes and cylinders as per IS	02
15	To calculate tensile test of concrete cylinders as per IS	02

### Reference Books:

1. Concrete Technology by M.S.Shetty, S Chand Publication.
2. Concrete Technology by M. L. Gambhir, TMH Publication.
3. Concrete Technology by S.V.Deodhar, Central Techno Publication
4. Concrete Technology by N.V. Nayak & A.K. Jain, Narosa Publishing House Pvt. Ltd.
5. Concrete Technology by Kulkarni P.D. Ghosh, R.K. Phull Y.R., New Age International.

### Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

### Guide lines for ESE:

ESE will be based on term work submitted by the student. In ESE the student may asked to answer questions based on practical's performed /assignments. Evaluation will be based on performance in **oral** examination

# BUILDING CONSTRUCTION TECHNIQUES AND MATERIAL

## Lab course content

Teacher should facilitate learning following drawing plates

Sr.	List of sketches	Lab hours required
1	To draw 2D & 3D views of building	02
2	To draw sketches of various Doors types.	02
3	To describe the various types Windows and draw the sketches	02
4	To describe various types lintel, arches and draw the sketches	02
5	To describe various types of bond in brick masonry	02
6	To describe and draw sketches the brick, brick bats and their various views	02
7	To study king post, queen post roofs and draw the sketches	02
8	To study types of steel trusses, methods of connections and draw the sketches.	02
9	To study horizontal and vertical circulation(staircase)	02
10	Report regarding visit to the construction sites including drawing and photographs. (Minimum two visits are mandatory).	02
11	Market survey: Prepare the report of market survey for different building materials.	02

### Reference Books:

- 1) Building Construction by Rangwala- Published by Charotar)
- 2) Building Construction by Sushil Kumar- Published by Standard Publishers.
- 3) Building Construction by S.P. Bindra, S.P. Arora, Published by Dhanpat Rai Publications
- 4) Building Construction by Ashok Kr. Jain, B. C. Punmia, Arun Kr. Jain, Published by Laxmi Publications.
- 5) Engineering Materials by Rangwala, Publisher Charotar

### Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

### Guide lines for ESE:

ESE will be based on term work submitted by the student. In ESE the student may asked to answer questions based on practical's performed /assignments. Evaluation will be based on performance in **oral** examination.

# SURVEYING-I

## LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

### Group: - 01

Sr.	List of experiment	Lab hours required
1	Use and study of dumpy level for finding the levels by various methods.	2
2	Measurements of horizontal and vertical angles by transit Theodolite	2
3	Measurements of horizontal angles of a triangle by repetition method	2
4	Computation of horizontal distances and elevations by Tachometry for horizontal and inclined sights.	2
5	Radiation and intersection method in plane table survey.	2
6	Use of box sextant, Abney level and digital plan meter.	2

### Group: - 02

Sr.	List of experiment	Lab hours required
1	Theodolite traverse survey project of a closed traverse with at least four sides.	$\frac{1}{2}$ Working day
2	Tachometric contouring project with at least two instrument stations at 60 m apart.	$\frac{1}{2}$ Working day
3	Road project for minimum length of 200m, including fixing of alignment, profile leveling, and cross sectioning.	Full working day
4	Plane table survey project of a closed traverse of minimum four sides	$\frac{1}{2}$ Working day

### Reference Books:

1. Surveying and leveling (vol-I&II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. I and Vol .II by B.C.Punmia, Laxmi Publication (P) New Delhi.
3. Principles of surveying by Cliver and clendening
4. Advance surveying , Vol.I & II, Handbook by P.B. Shahani
5. A handbook of accurate surveying methods by S.P.Collins

**Guide lines for ICA:**

ICA shall be based on continuous evaluation of student performance throughout semester submitted by the student in the form of field book.

**Guide lines for ESE:**

ESE will be based on field book submitted by the student. In ESE the student may be asked to perform any two practical out of 6. Evaluation will be based on paper work, oral and performance in the practical.

**NORTH MAHARASHTRA  
UNIVERSITY,  
JALGAON (M.S.)**

**Second Year Engineering  
(CIVIL)**

**Faculty of Engineering and Technology**



**Teacher and Examiner's Manual**

**SEMESTER – IV**

**W.E.F 2013 – 2014**





# Engineering Geology

Teacher, paper setter and examiner should follow the guidelines as given below.

## Unit – I

Teacher should facilitate learning of Mineralogy & Petrology Concepts, Types of Rocks & Importance of Geology for Engineering Application point of view.

1.	<b>Mineralogy &amp; Petrology</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Introduction to the subject: - objects, scope, rock forming minerals, primary and secondary minerals.	02	01
b	Silicate and non silicate minerals, felsic and mafic minerals, essentials and accessories minerals	01	01
c	Origin, texture, structure, classification of igneous rocks, secondary rocks, metamorphic rocks and their engineering applications	02	01
d	Study of common rock types prescribed in practical work	02	01

## Unit – II

Teacher should facilitate learning of Basics of Structural Geological Features & Ground Water Studies for Engineering Applications.

2.	<b>Structural Geology, Plate Tectonics &amp; Ground water</b>	<b>Lecture required</b>	<b>Reference No</b>
A	Structural geology: Outcrop, dip and strike, conformable series, unconformity and overlap.	02	01
b	Faults and their types, folds and their types, inliers and outliers	02	01,04
c	Structural features resulted due to igneous intrusions, concordant and discordant igneous intrusions	01	01,04
d	Joints and their types and introduction to plate tectonics.	01	01,04
e	Water table and depth zones, relation between surface relief and water table, perched water table	01	01,04
f	Natural springs and seepages, contact springs, hot springs and geysers, artesian wells.	01	01,04

## Unit – III

Teacher should facilitate learning of geomorphology, historical geology, good building stones for engineering use & earthquake studies.

3.	<b>Geomorphology, Historical Geology &amp; Building stones</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Geomorphology: geological action of river, rejuvenation, land forms resulted due to river erosion, deposition and rejuvenation	02	01
b	Physiographic divisions of India and their characteristics, geological history of peninsula, study of formations in peninsula and the significance of their structural characters in	02	01

	major civil engineering activities.		
c	Requirements of good building stones, engineering properties of rocks. availability of blocks of suitable size and appearance on mineral composition, textures, structures.	02	01
d	Earthquake & its causes, classification, seismic zones of India & geological consideration for constructions of building.	02	01

#### Unit – IV

Teacher should facilitate learning of preliminary geological studies, significance of geological structures and landslides & geo-physical concepts.

4.	Preliminary Geological Studies, Remote function, Geo physical exploration.	Lecture required	Reference No
a	Verification of surface data by subsurface exploration, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts, etc.	02	01
b	Compilation and interpretation of information obtained from these. Correlation of surface data with results of subsurface exploration.	01	01
c	Limitations of drilling, comparative reliability of data obtained by drilling and excavation.	02	01
d	Engineering significance of geological structures such as stratification, dips, folds, faults, joints, crush zones, fault zones, dykes etc.	01	01
e	Landslides and It's Causes, preventive measures and case studies.	01	01
f	Principles of geo physical exploration methods for sub surface survey.	01	01

#### Unit - V

Teacher should facilitate learning of basic role of engineering geology in dams & tunneling and need for various treatment methods.

5.	Role of Engineering Geology in Dams and tunneling.	Lecture required	Reference No
a	Preliminary geological investigation for tunnels. Important geological consideration while choosing alignment	01	01
b	Role of groundwater, Geological conditions likely to be troublesome, Suitability of common rock type for tunneling, Unlined tunnels, Case studies.	02	01
c	Geological requirements for construction of dams and geological structures influence of geological condition on the choice of type and design of dam.	02	01
d	Preliminary geological work on dam sites, favorable and unsuitable geological conditions for locating a dam, precaution to be taken to counteract unsuitable condition.	02	01
e	Treatment of leaky rocks, faults, dykes, crush zones, joints, fractures, unfavorable dips, etc. and Case studies.	01	01

**Reference Books:**

1. R.B. Gupte : A Text Book of Engineering Geology -P.V.G. Publications, Pune.
2. M. Anji Reddy : A Text Book of Remote Sensing and Geographical Information Systems by - 2nd Edition B S Publication.
3. R. Legget : Geology and Engineering - McGraw Hill Book Co., London.
4. Arthur Holmes : Physical Geology -ELBS Publication.
5. Tony Waltham : Fundamentals of Engineering Geology, SPON Press.
6. J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.
7. K V G K Gokhale : Text Book of Engineering Geology, B S Publication
8. F G Bell : Fundamentals of Engineering Geology, B S Publication
9. B S Sthya narayanswami, "Engineering Geology", Dhanpat Rai & Co.
10. P. K. Mukerjee : A text Book of Geology, Calcutta Word Publishers.
11. Blyth F.G.M. A Geology for Engineers, Arnold London.
12. Prabin Singh. Engg. And general Geology. Katson Publishing House.
13. D.S.Arrora: Geology for Engineers, Mohindra Capital Publishing Chandigarh.

# Fluid Mechanics- I

Teacher, paper setter and examiner should follow the following guidelines.

## Unit - I

Teacher should facilitate learning of classification of fluids and fluid properties and their applications.

1.		Lectures required	Reference No.
a	A) <b>Introduction:</b> - Scope and applications of fluid mechanics, Newton's law of viscosity, classification of fluids: Newtonian and non-Newtonian fluids, ideal and real fluids, dynamic and kinematic viscosities.	03	1,3,4
b	B) <b>Physical properties of fluids</b> – Mass density, specific weight, specific volume, specific gravity.	02	1,3,4
c	Compressibility, surface tension, capillarity, vapour pressure.	02	1,3,4

## Unit - II

Teacher should facilitate learning of (1) measurement of fluid pressure using manometers, (2) calculation of fluid pressure on plane and curved surfaces and their applications, (3) Archimedes's principle and stability of floating and submersed bodies.

2.		Lectures required	Reference No.
a	A) <b>Fluid pressure measurement:</b> - Fluid pressure, pressure head, measurement of pressure: - Simple and differential manometers, introduction to mechanical gauges.	02	1,3,4
b	B) <b>Pressure on surfaces:</b> - Static fluid pressure forces on plane and curved surfaces and their civil engineering applications.	03	1,3,4,7
c	C) <b>Buoyancy:</b> - Archimedes's principle, buoyancy and flotation, metacentric height, stability of floating and submersed bodies.	03	1,3,4,7

## Unit – III

Teacher should facilitate learning of kinematics and dynamics of fluid flow including equations of continuity, energy and momentum.

3.		Lectures required	Reference No.
a	<b>Kinematics of fluid flow</b> - types of fluid flows:–steady and unsteady; uniform and non uniform; laminar and turbulent; one, two and three dimensional; rotational	02	1,3,4,7

		and irrational flows. Velocity & acceleration for one and three dimensional flows.		
	b	Stream lines, equipotential lines and flow net, uses and limitations of flow net. Equations of continuity for one and three-dimensional flows.	02	1,3,4,7
	c	<b>Dynamics of fluid flow</b> – Forces acting on fluids in motion. Mention of various equations of motion. Euler’s equation of motion and Bernoulli’s theorem for one and three dimensional flows, hydraulic gradient line and total energy line, kinetic energy correction factor.	03	1,3,4
	d	Simple applications of continuity and Bernoulli’s equations such as Pitot tube and Venturimeters. Introduction to linear momentum principle.	02	1,3,4

### Unit – IV

Teacher should facilitate learning of (1) Dimensional analysis including Buckingham pi theorem, (2) model analysis including Reynolds and Froude’s model laws, (3) Laminar flow in pipes and its civil engineering applications.

1.			Lectures required	Reference No.
	a	<b>A) Dimensional analysis and Hydraulic similitude:</b> Dimensions of physical quantities, dimensional homogeneity, Buckingham pi-theorem.	02	1,3,4
	b	<b>Model analysis:</b> geometric, kinematics and dynamic similitudes, important dimensionless parameters and their significance (Reynolds and Froude numbers only). Model laws: Reynolds and Froude model laws and their applications to simple fluid flow problems.	02	1,3,4
	c	<b>B) Laminar flow:</b> – Laminar flow through pipes- agen-Poiseuilli’s equation.	02	1,3,4
	d	Stoke’s law. Mention of various methods of measurement of viscosity. Reynolds’s experiment, transition from laminar to turbulent flow.	01	1,3,4

### Unit – V

Teacher should facilitate learning of flow measurement using orifices, mouthpieces, notches and weirs.

1.			Lectures required	Reference No.
	a	<b>A) Flow through opening – Orifices:</b> types, coefficients of velocity, contraction and discharge, small	03	1,3,4

		and large orifices, completely submerged orifices.		
	b	<b>Mouthpieces:</b> Types, external cylindrical mouthpiece.	01	1,3,4
	c	<b>B) Flows over notches and weirs</b> – Rectangular, triangular and trapezoidal notches and weirs, Cipolletti weir, empirical formulae for discharge over rectangular weirs, corrections for velocity of approach and end contractions.	04	1,3,4

**Reference Books:-**

1. Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers, Delhi.
2. Hydraulic and Fluid Mechanics by Dr. P.N.Modi , Dr. S.M. Seth, , Standard Publications, Delhi.
3. A Textbook of Fluid Mechanics & Hydraulic Machines by Dr. R.K.Bansal, Laxmi Publications (P) Limited.
4. 1000 Solved Problems in Fluid Mechanics by Dr. K. Subramanya, , Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Fluid Mechanics by Dr.Garde and Mirajgaokar.
6. Introduction to Fluid Mechanics and Fluid Machines by Som S K and Biswas G, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
7. Fluid Mechanics by Streeter and Wylie, McGraw-Hill Book Company.

## Theory of Structure-I

Teacher, Paper setter and Examiner should follow the guidelines as given below.

### Unit - I

Teacher should facilitate learning of basic of (i) geometrical methods and (ii) energy methods to find slope and deflection.

1.	<b>A. Deflection of Beams</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Relation between BM, slope and deflection, Introduction to double integration method	1	1&3
b	Concept of moment area method, Mohr's theorems	1	1&3
c	Use of moment area method to calculate slope and deflections of beams such as simply supported.	2	1&3
d	Use of moment area method to calculate slope and deflections of beams such as overhanging and of uniform cross sections and different cross sections.	1	1&3
e	Conjugate beam method, Application of conjugate beam method to simply supported, overhanging and compound beams.	2	1&3
<b>B. Strain Energy</b>			
f	Castiglino's first theorem and its application to find slope & deflection of simple beams and frames.	2	1 & 4

### Unit – II

Teacher should facilitate learning of concept of finding forces in members of trusses and deflection for determinate and redundant trusses.

2.	<b>A. Deflection of determinate trusses</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Deflection of statically determinate plane trusses by Castiglino's first theorem.	3	1 & 4
<b>B. Analysis of redundant trusses</b>			
b	Analysis of redundant trusses by Castiglino's second theorem, lack of fit.	2	1 & 4
c	Effect of temperature changes in members, sinking of supports (degree of indeterminacy maximum up to 2 only).	2	1 & 4

### Unit – III

Teacher should facilitate learning of concept of fixed & continuous beams & drawing SFD & BMD for same under different loading conditions.

3.	<b>A. Fixed Beams</b>	<b>Lecture required</b>	<b>Reference No</b>
a	Concept, advantages and disadvantages, Nature of B.M. Diagrams.	1	1 & 4

b	Fixed end moment due to various types of loads such as point, uniformly distributed, Uniformly varying, couples for beams. V	2	1 & 4
c	Effect of sinking of support, plotting of B.M. & S.F. diagrams. V	1	1 & 4
<b>B. Continuous Beams</b>			
d	Analysis of continuous beam by three moment (Clayperon's theorem) up to three unknowns.	2	1 & 4
e	Effect of sinking of supports, plotting of B.M. & S.F. diagrams.	2	1 & 4

#### Unit – IV

Teacher should facilitate learning of concept of (i) geometry of arches, (ii) horizontal thrust, normal thrust and radial shear

4. A. Three hinged arch		Lecture required	Reference No
a	Explain geometry of circular and parabolic hinged arches, describe normal thrust and radial shear, Concept of three hinged arch as a haunched beam.	1	1 & 4
b	To determine support reactions, B.M., S.F. , normal thrust and radial shear and draw axial thrust diagrams for circular and parabolic three hinged arches.	2	1 & 4
<b>B. Two hinged arch</b>			
c	Derivation for horizontal thrust, calculation of, normal thrust and radial shear, horizontal thrust, BM due to point load at crown and due to eccentric point load for circular and parabolic two hinged arches.	2	1 & 4
d	Derivation for horizontal thrust, calculation of, normal thrust and radial shear, horizontal thrust, BM due to point load at crown and due to udl for circular and parabolic two hinged arches.	2	1 & 4

#### Unit - V

Teacher should facilitate learning of concept of influence lines and moving loads, concept of maximum SF and BM at a section, absolute maximum SF and BM in beams.

5. A. Influence lines		Lecture required	Reference No
a	Basic concepts, influence line for reactions, B.M. & S.F. for simply supported beams.	1	1 & 4
b	Basic concepts, influence line for reactions, B.M. & S.F. for overhanging beams and cantilever beams,	1	1 & 4
c	Calculations for reactions, S.F & B.M at a section in beams using influence lines.	1	1 & 4
<b>B. Moving loads</b>			
d	Calculations for maximum S.F & B.M at a section in beams using influence lines due to given moving point load.	1	1 & 4
e	Calculations for maximum S.F & B.M at a section in beams using influence lines due to udl longer or shorter than span.	1	1 & 4



f	Calculations for maximum S.F & B.M at a section in beams using influence lines due to train of moving loads.	1	1 & 4
g	Absolute maximum B.M. & S.F.in a beam due udl and train of moving loads.	1	1 & 4
h	Construction of Max. S. F. and B.M. diagram.	1	1 & 4

**REFERENCE BOOKS:-**

1. Structural analysis Vol –I, II by S.S. Bhavikatti, Vikas Publishing House Pvt. Ltd.
2. Mechanics of structures Vol – II by S. B.Junnarkar and Dr. H.J. Shah, Charotar Publishing House.
3. Analysis of structures (Volume - I & II) by V.N.Vazirani, M.M. Ratwani and Dr. S.K. Duggal, Khanna Publications.
4. Theory of structures by S. Rammamrutham, Dhanpatrai Publishing Company.
5. Basic structural analysis by C.S.Reddy
6. Indeterminate structures by C.K.Wang

## BUILDING DESIGN AND DRAWING

Teacher, Paper setter and Examiner should follow the guidelines as given below.

### Unit - I

Teacher should facilitate learning in detail types of building with the help of principle of planning and application of building bye laws for planning and construction. They should explain building ventilation, fire protection, air conditioning, and building services while planning and designing new building.

<b>Introduction to Building, types and other services.</b>		<b>Lecture required</b>	<b>Reference No</b>
a	<b>Introduction to buildings definition and types</b> Building definition and types of building as per occupancy, principles of planning of residential buildings,	01	01, 03,04
b	<b>Building rules and regulations</b> Plan sanctioning procedure, building bye laws & its necessity, open space, floor space ratio,	02	01, 02, 05
c	<b>Ventilation and Air conditioning of buildings</b> Necessity of ventilation, functional requirements, systems of ventilation and their choice ,movement of wind through building, wind effect etc	01	01, 03, 05
d	<b>Air conditioning</b> classification, comfort and comfort conditions, principles and system of comfort, object and necessity of air conditioning	01	01, 03, 05
e	<b>Fire protection</b> Fire load, fire safety, grading of occupancy by fire load, considerations in fire protection, fire resistant construction & wall openings, fire escape elements.	01	01, 05
f	<b>Building services</b> its importance , constructional requirements for different building services-like electrical, Tele communication service	01	01
g	<b>Plumbing services</b> layout of water supply and drainage system, one pipe and two pipe system, storage & disposal arrangement, septic tank, garbage disposal arrangements, solar water heater	01	02

### Unit – II

Teachers should facilitate learning of types of residential buildings, planning and designing of different units of residential buildings according to their purpose & working drawings, their importance on field construction & estimation.

<b>Planning and designing of residential buildings</b>		<b>Lecture required</b>	<b>Reference No</b>
a	<b>Planning and designing of residential building</b> detached, semidetached & row houses (Load bearing structures )	03	01, 03, 04

b	<b>Planning and designing of residential building</b> detached, semidetached & row houses (Frame structures)	04	01, 02, 03,04
c	<b>Working drawings</b> Importance and use of all types of working drawings at site	01	03

### Unit – III

Teacher should facilitate learning of Planning and designing of apartment houses (flats) and how to draw perspective drawings

<b>Planning and designing of apartment houses and perspective views</b>		<b>Lecture required</b>	<b>Reference No</b>
a	<b>Planning and designing of apartment houses (flats)</b> framed Structure only	04	01,02, 03
b	<b>Perspective drawings</b> One point and two point perspective drawings	04	01, 03, 04

### Unit – IV

Teacher should facilitate Planning and designing of public buildings

<b>Planning and designing of public buildings</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Educational buildings (frame Structure only )	02	01,03
b	Hostel buildings (frame Structure only )	02	01,03
c	Library buildings (frame Structure only )	01	01,03
d	Restaurants (frame Structure only )	01	01,03
e	Hotels/lodging-boarding buildings (frame Structure only )	01	01,03
f	Primary health centers/hospitals (frame Structure only )	01	01,03

### Unit - V

Teacher should facilitate learning Planning and designing of bus stand buildings

<b>Planning and designing of Public buildings</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Bus stand buildings (frame Structure only )	02	01,03,04
b	Commercial complex buildings (frame Structure only )	02	01,03
c	Bank buildings (frame Structure only )	01	01,03,04
d	Post office buildings (frame Structure only )	01	01,03
e	Community/marriage halls (frame Structure only )	01	01,03,04
f	factory buildings (frame Structure only )	01	01,03

**Reference Books:**

1. Building Drawing by M.G. Shah, C.M. Kale, S.Y. Patki, Tata Mcgraw Hills pvt. Ltd.New Delhi.
2. Planning & Designing Building, Y.S.Sane.
3. Building Science and Planning by Dr . S.V. Deodhar
4. Building planning & drawing by Dr N Kumara Swamy & A Kameswara Rao ,charotar publishing house.
5. National building Code (Latest)

## Surveying-II

Teacher, Paper setter and Examiner should follow the guidelines as given below.

### Unit – I

Teacher should facilitate learning of geodetic surveying and its application.

<b>A. Geodetic Surveying:</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Objects, methods in geodetic surveying	01	1 & 2
b	Triangulation figure, Strength of figure, Classification of triangulation system	01	1 & 2
c	Selection of stations, intervisibility of height of station	02	1 & 2
d	Towers, signal and their classification	01	1 & 2
E	Phase of signals	01	1 & 2
F	Satellite station and Reduction to centre Eccentricity of signals	01	1 & 2
g	Base line measurement, Apparatus used, Base net; equipment used for base line measurement, Extension of a base.	01	1 & 2

### Unit – II

Teacher should facilitate learning of triangulation adjustments

<b>B. Triangulation Adjustments</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Kinds of errors; laws of weights, Determination of the most probable values of quantities, the method of least squares	1	1 & 2
b	Indirect observations on independent quantities, normal equation, conditioned quantities	2	1 & 2
c	The probable error and its determination, distribution of error to the field measurements	1	1 & 2
d	Method of correlates, station adjustment and figure adjustment	1	1 & 2
e	Adjustment of a geodetic triangle , figure adjustment of a triangle, calculation of spherical triangle	1	1 & 2
	Adjustment of geodetic quadrilateral, Adjustment of a quadrilateral with a central station by method of least squares.	2	1 & 2

### Unit – III

Teacher should facilitate learning of application of photogrammetry in civil engineering field

<b>C. Photogrammetry</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Object, application to various fields, terrestrial photogrammetry (only general idea) and aerial photogrammetry, Aerial camera	2	5
b	Comparison of map and vertical photograph, Vertical tilted and oblique Photographs	1	5

c	Concept of principal point nadir point, isocentre, horizon point and principal plane, Scale of vertical photograph; computation of length and height from the photograph	1	5
	Relief displacement on vertical photograph	1	5
	Flight planning; ground control ; radial line method	2	5
	Mirror and lens Stereoscopes	1	5

#### Unit – IV

Teacher should facilitate learning of hydrographic surveying

<b>D. Hydrographic Surveying</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Objects, establishing controls, shore line survey, river surveys	1	1 & 2 &3
b	Soundings, tide gauges, Equipment for taking soundings; signals.	2	1 & 2 &3
c	Nautical sextant, measuring horizontal and vertical angles with the nautical sextant.	2	1 & 2 &3
	Sounding party, ranges making the soundings, methods of locating the soundings, reduction of soundings	1	1 & 2 &3
	The three point problem and methods of solution	2	1 & 2 &3

#### Unit - V

Teacher should facilitate learning of remote sensing application in civil engineering field

<b>E. Remote Sensing</b>		<b>Lecture required</b>	<b>Reference No</b>
a	Basic principles, importance, scope	1	2&3
b	Sensors used in remote sensing, platforms,	1	2&3
c	Applications of remote sensing to Civil Engineering	2	2&3
d	<b>Use of advance electronics instruments in Surveys</b> Study and use of various electronics equipments like EDM and Total station	3	2&3

#### Reference Books:

1. Surveying and leveling (vol-II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. II and Vol .III by B.C.Punmia, Laxmi Publication (P) New Delhi.
3. Advance surveying by P.Som , B.N.Ghosh, TMH Publication.
4. Surveying by Norman Thomas
5. Elements of Photogrammetry by Paul Richard Wolf, McGraw-Hill Education (India) Pvt Limited.
6. Plane and geopdesic surveying by David Clark, J. E. Jackson
7. Principal of remote sensing by A. N. Patel

## Computer Graphics in Civil Engineering

Teacher, Paper setter and Examiner should follow the guidelines as given below.

### Unit - I

Teacher should facilitate learning of Basics of AutoCAD software & its various Engineering applications.

1.	Introduction to AutoCAD (Automatically Computer Aided Drafting/Designing)	Lecture required	Reference No
a	Introduction to CAD, Introduction to drafting software.	03	
b	Explanation to precision drawing & drawing tools, geometric shapes, basic printing, editing tools.	04	

### Unit – II

Teacher should facilitate learning of Basics of various Engineering & Architectural Views.

2.	Engineering and Architectural Views	Lecture required	Reference No
a	Engineering and architectural views, drafting views, layers, templates & design center, dimensioning, blocks	03	
b	Office standards, drafting symbols, introduction to 3D.	03	

# COMPUTER GRAPHICS IN CIVIL ENGINEERING

## LAB COURSE CONTENT

Teacher should facilitate learning of following lab experiments (Drawings on A4 size sheets):

Sr.	Experiment Name	Lab hours required
1	Practice assignments on CAD drafting tools (Min. 2 Assignments).	06
2	Detailed Plan of 2 BHK house. a) Foundation plan. b) Typical Floor Plan. c) Elevations.	12
3	Detailed drawing of Structural Elements from given data. a) Detailing of RCC Isolated Column Footing b) Detailing of RCC Column and Beam	08

### Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.



# ENGINEERING GEOLOGY

## LAB COURSE CONTENT

Teacher should facilitate learning following lab experiments:

Experiment Name		Lab hours required
1	<b>Identification of following minerals in hand specimens:-</b> Quartz and its varieties, common varieties of cryptocrystalline and amorphous silica, orthoclase, plagioclase, muscovite, biotite, zeolites, calcite, gypsum, fluorite, barites, tourmaline, beryl, asbestos, talc, kyanite, garnet, galena, magnetite, haematite, limonite, iron pyrites, chromite, bauxite.	06
2	<b>Identification of following different rock types in hand specimens:-</b> Granites, Syenites, Diorites, Gabbros, Rhyolites, Trachytes, Andesites, Basalts, Varieties of Deccan Trap rock, Volcanic breccias, Pegmatites, Dolerites, Graphic granites, Laterites, Bauxites, Conglomerates, Breccias, Sand stones, Quartzites, Grits, Arkose, Shales, Chemical and organic lime stone. Marbles, Quartzites, Varieties of Gneisses, Slates, Phyllites and varieties of Schists.	06
3	Construction of geological section from contoured geological maps	04
4	Interpreting geological features without drawing section	02
5	Solution of engineering geological problems such as alignment of dam, tunnels, roads, canals, bridges, etc. based on geological maps.	04
6	Logging of drill core and interpretation of drilling data with graphical representation of core log.	04
7	One site visit is desirable to study geology and its engineering applications, submission of field report.	-

### Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

### References:

1. R.B. Gupte : A Text Book of Engineering Geology -P.V.G. Publications, Pune.
2. M. Anji Reddy : A Text Book of Remote Sensing and Geographical Information Systems by - 2nd `Edition B S Publication.
3. R. Legget : Geology and Engineering - McGraw Hill Book Co., London.
4. Arthur Holmes : Physical Geology -ELBS Publication.
5. Tony Waltham : Fundamentals of Engineering Geology, SPON Press.
6. J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.
7. K V G K Gokhale : Text Book of Engineering Geology, B S Publication

8. F G Bell : Fundamentals of Engineering Geology, B S Publication
9. B S Sthya narayanswami, "Engineering Geology", Dhanpat Rai & Co.
10. P. K. Mukerjee : A text Book of Geology, Calcutta Word Publishers.
11. Blyth F.G.M. A Geology for Engineers, Arnold London.
12. Prabin Singh. Engg. And general Geology. Katson Publishing House.
13. D.S.Arrora: Geology for Engineers, Mohindra Capital Publishing Chandigarh.

# FLUID MECHANICS- I

## LAB COURSE CONTENT

Teachers and Examiners should follow the following guidelines.

1. Teacher should facilitate following lab experiments/assignments:

Sr No.	Name of experiment	Lab hours required
1	<b>Measurement and study of variation of viscosity of oil with temperature.</b> a. To calculate kinematic viscosity of oil at different temperatures by measuring time to collect 50 ml of oil from the cylinder of viscometer. b. To plot graph of viscosity versus temperature and hence to find the viscosity of the oil at room temperature.	02
2	<b>Study of simple and differential manometers.</b> a. To measure fluid pressure at any point by simple U – tube mercury manometer. b. To measure difference of pressure by differential U – tube mercury manometer.	02
3	<b>Buoyancy: metacentric height of ship model.</b> a. To calculate metacentric height of cargo and war ship by knowing total weight of ship, movable weight and measuring its distance from centre and angle of tilt of ship. b. To compare and analyze metacentric heights of cargo and war ships.	02
4	<b>Study of Bernoulli's theorem.</b> a. To measure pressure by piezometers at various points along the conduit. b. To calculate discharge through the conduit by measuring volume of water and the required time. c. To calculate velocities at the points by knowing the discharge and the cross sectional areas of the conduit at these points. d. To compute total energy of flow at these points and thus to verify Bernoulli's theorem and calculate losses of energy. e. To plot graphs of total energy head and piezometric head and length of the conduit.	02
5	<b>Calibration of Venturimeter.</b> a. To calculate discharge experimentally through the venturimeter by measuring volume of water and the required time. b. To compute the discharge analytically by knowing the diameters of inlet and throat and measuring the pressure difference between the inlet and throat by differential mercury manometer. c. To calculate the coefficient of discharge of the venturimeter. d. To plot the graph of discharge and the pressure head difference and hence to evaluate the calibration equation for the venturimeter.	02
6	<b>Electrical analogy method.</b> a. To identify equipotential lines by observing equal voltage at	02

	<p>different points and hence to draw the same.</p> <p>b. To draw, in the same way, the streamlines and hence the flow net.</p> <p>c. To analyze the flow net at different cross sectional areas of the flow passage.</p>	
7	<p><b>Study of laminar flow in Reynolds apparatus.</b></p> <p>a. To calculate discharges through the conduit by measuring volume of water and the required time.</p> <p>b. To calculate velocity and hence the Reynolds number of flow.</p> <p>c. To observe and analyze the dye filament and hence the type of flow as laminar / turbulent</p>	02
8	<p><b>Determination of coefficients of Orifice / Mouthpiece</b></p> <p>a. To calculate discharge experimentally through the orifice by measuring volume of water and the required time.</p> <p>b. To compute the discharge analytically by knowing the diameter of orifice and measuring the head over the orifice</p> <p>c. To measure coordinates of any point on the jet.</p> <p>d. To calculate the coefficients of discharge, velocity and contraction.</p> <p>e. To plot the graph of discharge and the head and hence to evaluate the calibration equation for the orifice.</p>	02
9	<p><b>Calibration of notch.</b></p> <p>a. To calculate discharge experimentally through the notch by measuring volume of water and the required time.</p> <p>b. To compute the discharge analytically by knowing the dimensions of the notch and measuring the head over the notch.</p> <p>c. To calculate the coefficient of discharge.</p>	02
10	<p><b>Study of Impact of jet.</b></p> <p>a. To calculate discharge through the nozzle by measuring volume of water and the required time.</p> <p>b. To find the velocity of the jet striking the plate by knowing the diameter of nozzle.</p> <p>c. To compute analytically the force exerted by the jet on the plate by using the momentum principle.</p> <p>d. To calculate experimentally the force exerted by the jet on the plate by measuring the weights and the liver arm.</p> <p>e. To compute the coefficient of impact of the plate and thus to discuss the momentum principle and its applications.</p>	02
11	<p><b>Visit to WALMI, Aurangabad or any other such relevant place.</b></p> <p>a. To study measurement of discharge on field (in open channels) by using triangular and other notches.</p>	

**Note: The Term Work will consist of a laboratory journal consisting of minimum eight experiments/assignment.**

**Guidelines for ICA :**

ICA shall be based on continuous evaluation of students' performance throughout the semester and practical assignments submitted by the students in the form of journal.

**Guide lines for ESE:-**

ESE will be based on laboratory journal submitted by the student. In ESE the student may be asked to answer questions based on experiments/assignments. Evaluation will be based on performance in **oral** examination.

**Reference Books:-**

1. Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers, Delhi.
2. Hydraulic and Fluid Mechanics by Dr. P.N.Modi , Dr. S.M. Seth, , Standard Publications, Delhi.
3. A Textbook of Fluid Mechanics & Hydraulic Machines by Dr. R.K.Bansal, Laxmi Publications (P) Limited.
4. Fluid Mechanics by Dr.Garde and Mirajgaokar.
5. Introduction to Fluid Mechanics and Fluid Machines by Som S K and Biswas G, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

**BUILDING DESIGN AND DRAWING**  
**LAB COURSE CONTENT**

Teacher should facilitate learning following lab experiments:

Sr.	Group-A	Lab hours required
1	<b>Planning of a small residential buildings/bungalow/duplex from given data (load bearing or framed structure).</b> Draw first floor Plans	02
2	showing furniture arrangement	02
3	front elevation,	02
4	sections (preferably through staircase)	02
5	built up area calculations and schedules of area & openings	02
6	Perspective view of plan drawn in sheet no- 1	02
<b>Group-B</b>		<b>Lab hours required</b>
6	<b>Project work</b> <b>Preparation of working drawings after planning and designing of buildings mentioned in Unit II, III, IV &amp; V</b> Layout plan of project building (project sheet no -1)	02
7	Typical floor plans (project sheet no -2)	02
8	Foundation plan (project sheet no -3)	02
9	Front and Road side elevations (project sheet no -4)	02
10	Sections (one preferably through staircase). (project sheet no -5)	04
11	Layout plan showing water supply and drainage arrangements. :( Project sheet no -6)	02
12	Drawings:- Layout/Floor plan and elevation using computer drafting software on A4 size sheets.	02
13	Line plans of various public buildings. (any five types) using computer drafting software on A4 size Sheets.	02
14	Report regarding visit of any advanced building construction site, preferably visit to the site of building given for the project work with photos/drawings etc. (visit is mandatory )	02

**Guidelines for ICA :**

ICA shall be based on continuous evaluation of students' performance throughout the semester and term work drawing sheets submitted by the students.

**Guide lines for ESE:-**

ESE will be based on drawing sheets submitted by the student. In ESE the student may asked to answer questions based on term work /assignments. Evaluation will be based on performance in **oral** examination.

**Reference Books:**

1. Building Drawing - M.G. Shah, C.M. Kale, S.Y. Patki - Tata Mcgraw Hills pvt. Ltd.New Delhi.
2. Y.S.Sane - Planning & Designing Building.
3. Building Science and Planning by Dr . S.V. Deodhar
4. National building Code (Latest)

**SURVEYING-II**  
**LAB COURSE CONTENT**

Teacher should facilitate learning following lab experiments:

<b>Sr.</b>	<b>List of experiments</b>	<b>Lab hours required</b>
1	Measurement of horizontal and vertical angles by One Second Theodolite	2
2	Measurement of horizontal angles by reiteration method.	2
3	Study and use of mirror stereoscope and finding out the air base distance	2
4	Hydrographic survey i) Study and use of nautical sextant for measurement of angles. ii) Solution of three point problem.	2
5	Measurement of angles and elevation by Total Station / Study and use of E.D.M	2

**Reference Books:**

1. Surveying and leveling (vol-II) by T.P. Kanitkar, & S.V. Kulkarni, Pune Vidarthi Griha Prakashan, Pune,
2. Surveying Vol. II and Vol .III by B.C.Punmia, Laxmi Publication (P) New Delhi.
3. Advance surveying by P.Som , B.N.Ghosh, TMH Publication.
4. Surveying by Norman Thomas
5. Elements of Photogrammetry by Paul Richard Wolf, McGraw-Hill Education (India) Pvt Limited.
6. Plane and geopdesic surveying by David Clark, J. E. Jackson
7. Principal of remote sensing by A. N. Patel

**Guide lines for ICA:**

ICA shall be based on continuous evaluation of student performance throughout semester submitted by the student in the form of field book.

**Guide lines for ESE:**

ESE will be based on field book submitted by the student. In ESE the student may be asked to perform any two practical out of 5. Evaluation will be based on paper work, oral and performance in the practical.