

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Second Year Engineering

(CIVIL ENGINEERING)

Faculty of Engineering and Technology



COURSE OUTLINE

SEMESTER – III

W.E.F 2013 – 2014

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SE (Civil) : Semester - III

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory			Practical	Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Engineering Mathematics - III	* A/D	3	1	---	4	20	80	---	---	100	4
Strength of Materials	B	3	1	---	4	20	80	---	---	100	4
Concrete Technology	D	3		---	3	20	80	---	---	100	3
Building Construction Techniques and Materials	D	3	---	---	3	20	80	---	---	100	3
Surveying I	D	3	---	---	3	20	80	---	---	100	3
Soft Skills – III	C	1	---	2	3	---	---	50	---	50	2
Strength of Materials lab	B	---	---	2	2	---	---	50	---	50	1
Concrete Technology lab	D	---	---	2	2	---	---	25	25	50	1
Building Construction Techniques and Materials lab	D	---	---	2	2	---	---	25	25	50	1
Surveying I lab	D	---	---	2	2	---	---	25	25(PR)	50	1
Total		16	2	10	28	100	400	175	75	750	23

ISE: Internal Sessional Examination
ICA: Internal Continuous Assessment

ESE: End Semester Examination

Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot. Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

*** E & TC, Mechanical, Automobile & Production Engineering branches shall have group D course and rest of the branches shall have group A course (e.g. Engineering Mathematics-III).**

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ENGINEERING MATHEMATICS –III

COURSE OUTLINE

Course Title	Short Title	Course Code
Engineering Mathematics –III	M-III	

Course description:

The course deals with solution of n^{th} order LDE by different methods. Applications of PDE to solve Laplace's equation, heat equation etc. It also introduces students about real life problems of statistics and sampling theory. It includes vector differentiation with its applications.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	04
Tutorial	01	13	13	

Prerequisite Course(s): Engineering Math's – I & II

COURSE CONTENT

Engineering Mathematics –III

Semester-III

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks

Tutorial: 01/week

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

UNIT-I: Linear Differential Equations:

(08 Hours, 16 marks)

- Solution of LDE of order n with constant coefficients.
- Method of variation of parameters (Only second order).
- Cauchy's linear equation.
- Legendre's linear equation.

UNIT-II: Applications of Linear Differential Equations and Partial Differential Equations

(08 Hours, 16 marks)

- Applications of linear differential equations to Strut, bending of beams, columns.
- Applications of Partial Differential equations to

i) One dimensional heat flow equation $\frac{\partial u}{\partial t} = C^2 \frac{\partial^2 u}{\partial x^2}$

ii) Two dimensional heat flow equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$

UNIT-III: Statistics and Probability distributions (08 Hours, 16 marks)

- Introduction to Mean, Mode, Median, standard deviation, Variance, Coefficient of variation.
- Moments, Skewness and Kurtosis.
- Correlation and Regression.
- Binominal distribution.
- Poisson distribution.
- Normal distribution.

UNIT-IV: Testing of Hypothesis and Significance (08 Hours, 16 marks)

- Introduction to population parameters and statistics.
- Testing of hypothesis, Null hypothesis and Alternative hypothesis.
- Level of significance.
- Test of significance of large sample.
- Chi-Square test.
- T-test.

UNIT-IV: Vector Differentiation (07 Hours, 16 marks)

- Gradient of scalar point function.
- Directional derivatives of scalar point function.
- Divergence and Curl vector field.
- Solenoidal and Irrotational vector fields.
- Applications to Bernoulli's equation.

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 - Mc Graw Hill
5. B.V. Raman - Engineering Mathematics - Tata Mc- Graw – Hill.
6. A Text Book of Engineering Mathematics, By N. P. Bali, Laxmi Publication.

STRENGTH OF MATERIALS COURSE OUTLINE

Course Title

Short Title Course Code

Strength of Materials

SOM

Course Description:

The course deals with response of solid bodies under the action of loads. It is an application of principles of mechanics to study behavior of deformable bodies. The main objective of subject is to determine internal forces, stresses, strains and deformation of structure due to external loads.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	04
Tutorial	01	13	13	

Prerequisite Course(s): Engineering Mechanics

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COURSE CONTENT

Strength of Materials

Semester-III

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks

Tutorial: 01/week

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

UNIT-I:

No of Lect. – 9, Marks: 16

Normal stress and strain, tensile, compressive and shear stresses Hooke's law, deformation in prismatic, stepped, & composite members due to concentrated load & self-weight, stress & strain in determinate and indeterminate members, temperature stresses.

UNIT-II:

No of Lect. – 7, Marks:16

[A] Shear stress & strain, modulus of rigidity, Poisson's ratio, bulk modulus, relation between E, G & K, generalized Hooke's law, stress strain diagram, working stress, factor of safety.

[B] Strain energy, stresses due to various types of axial load using strain energy method.

UNIT-III:**No of Lect. – 8, Marks: 16**

[A] Concept of shear force and bending moment, shear force & bending moment diagrams for cantilevers, simple and compound beams due to concentrated, uniformly distributed, uniformly varying loads and couples, construction of loading diagrams and bending moment diagram from shear force diagram.

[B] Bending stresses in beams: Introduction to moment of inertia, parallel and perpendicular axis theorem, theory of simple and pure bending, section modulus, moment of resistance, bending stress distribution diagram.

UNIT-IV:**No of Lect. – 8, Marks: 16**

[A] Shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams.

[B] 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.

[C] Axially loaded columns: Euler's theory of long columns, assumptions made in Euler's theory, limitations of Euler's formula. Various end conditions & concept of equivalent length, Rankine's formula,

UNIT-V:**No of Lect. – 7, Marks: 16**

[A] Direct & bending stresses in short columns & other structural components due to eccentric or lateral loads, the middle third rule, core of section.

[B] Principal stresses & strain: Concept of principal stresses and planes, normal and tangential stress on any oblique plane, determination of principal stresses and principal planes, Mohr's circle method.

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

COURSE OUTLINE

Course Title

Short Title Course Code

Concrete Technology

CT

Course description:-

This course introduces the students about properties of materials such as water cement, sand and aggregates and concrete. It describes various tests on fresh and hardened concrete. The course includes various admixtures and their effects, types of concrete and special concreting techniques. Various methods of concrete mix design are also discussed.

	Hours per weeks	Nos. Of weeks	Total Hours	Semester Credit
Lecture	3	13	39	03

COURSE CONTENT

Concrete technology

Semester-III

Teaching Scheme

Examination Scheme

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

UNIT-I

No. of Lect. – 8, Marks: 16

1. Cement: - Manufacture of cement, chemical composition, setting and hydration of cement. Types of cement, properties and testing of cement.
2. Aggregates – Classification, properties, grading, impurities in aggregates and testing of aggregates, its effect on strength of concrete. Quantity of water for concrete.

UNIT- II

No. of Lect. – 8, Marks: 16

1. Fresh Concrete: - Definition and its ingredients, grades of concrete, concreting process, significance of water cement ratio. Properties of fresh concrete.
2. Hardened Concrete:
Various properties of hardened concrete, factors affecting various properties, micro cracking, and stress - strain relation, testing of hardened concrete, creep.
3. Shrinkage of concrete, quality control during concreting.

UNIT-III**No of Lect. – 8, Marks: 16**

1. Admixtures, classification and their effects on various properties of concrete.
2. Types of Concrete: - Light weight concrete, polymer concrete, fiber reinforced concrete, ready mixed concrete, self compacting and high performance concrete, ferro cement concrete.
3. Special concrete- Transparent concrete, cellular light wt. concrete, pre-stressed concrete,
4. Under water concreting, concreting in extreme weather conditions.

UNIT-IV**No of Lect. – 8, Marks: 16**

Concrete mix design

1. Introduction, object of mix design, factors to be considered, statistical quality control, introduction to different methods of mix design. Scaffolding, shoring, under pinning and strutting, types, purposes and precautions.
2. Concrete mix design by I.S.(10262-456) method and IRC method

UNIT-V**No of Lect. – 7, Marks: 16**

1. Introduction to non-destructive testing of concrete, rebound hammer, ultrasonic pulse velocity, pull out test, impact echo test.
2. Deterioration of concrete, permeability, durability, chemical attack, carbonation of concrete, corrosion of reinforcement.

Text 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.

Reference books:-

1. Concrete Technology by A.N. Neville, J.J. Brooks, Addition Wesley
2. Concrete Technology by R.S. Varshney, Oxford & I B H.
3. Concrete Technology by P Kumar Mehta, Gujrat Ambuja

BUILDING CONSTRUCTION TECHNIQUES AND MATERIALS

COURSE OUTLINE

Course Title

Short Title Course Code

Building Construction Techniques and Materials

BCT&M

Course Description:-

This course deals with concepts in Building Construction Listed as below

- Types of building structures & various parts of building,
- Different types of masonry, scaffolding, shoring, under pinning and strutting.
- Description of building finishes and types
- Concrete and R.C.C. construction
- Types of foundations
- Study of building materials such as stone, bricks & timber, Aluminium, glass, heat insulating and sound absorbent materials.

	Hours per weeks	Nos. Of weeks	Total Hours	Semester Credit
Lecture	3	13	39	3

COURSE CONTENT

Building construction techniques and materials

Semester-III

Teaching Scheme

Examination Scheme

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

UNIT-I

Types of building and foundation

No of Lect. – 8, Marks: 16

Types of building, load bearing, framed structure, steel structure, timber structure, composite structure. Various parts of building, sub structure and super structure. Plinth, sill, floor, and roof level, plinth height, plinth protection, cornice, coping and their function.

Foundation: Purpose and classification, advantages and disadvantages of each and circumstances under which each is used. Factor considered for selection of foundation.

UNIT-II

Masonry and form work

No of Lect. – 8, Marks: 16

1. Masonry: Principle of masonry construction, types of masonry, types of wall (load bearing, partition, timber partition, glass partition etc.)
2. Brick and brick masonry: Various 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.
3. Formwork: Function of form work, form erection, oiling and stripping of form, requirements of form and form work, material used for form work.

UNIT-III

Study of lintel doors & windows, circulation

No of Lect. – 8, Marks: 16

1. Types of lintel, detailing of R.C.C. lintel, precast lintel and stone lintel.
2. Doors and windows: Type of each and circumference under which each is used, minimum area of window opening for different climatic conditions, various material used for doors and window, fixtures and fastening used. I.S. notations for doors and windows
3. Circulation: Horizontal and vertical, stair and staircase planning and design, types of staircase as per shape and material used, type of circulation.
4. Floor and roof: Ground floor, upper floor, mezzanine floor, design and constructional requirements, various types of floor finishes used, advantage and disadvantages, special flooring.

UNIT-IV

Truss and its type, R.C.C. framed structure

No of Lect. – 8, Marks: 16

1. Steel trusses: Types, Methods of connections, connecting materials.
2. Scaffolding, shoring, under pinning and strutting, their types, purposes and precautions.
3. R.C.C. framed structure, column, beam, footing, slab and their connections, general requirements and details.

UNIT-V

Study of various material used in construction

No of Lect. – 7, Marks: 16

1. Stone: Natural bed of stone, stone quarrying, uses of stones and qualities of good building stone, test's on stone.
2. Bricks: Composition of good brick earth, classification of burnt brick, manufacturing of bricks, qualities of good bricks, test on bricks.

3. Timber: Properties and uses, testing, conservation and sawing, defects in timbers, artificial timber, veneers, plywood and block board.
4. Other miscellaneous materials: Aluminium, glass, heat insulating materials, sound absorbent materials.

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 10th Edition.
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.

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SURVEYING - I

COURSE OUTLINE

Course Title

Short Title Course Code

Surveying- I

SUR-I

Course Description:-

- This course is set keeping in mind the requirements of undergraduate students of Engineering. This course provides the fundamental knowledge of surveying and leveling which includes:
- Basic principles of surveying and certain general topics such as bench marks, reduced levels and important aspect of leveling.
- Engineering surveys such as profile leveling and cross-sections.
- Measurements of horizontal angles, vertical angles, magnetic bearings, deflection angle by using optical theodolite with different techniques.
- Traverse computation: Consecutive and independent co-ordinates.
- Tachometric Surveying: Measurement of horizontal distances and vertical distances without using chains and tapes, tachometric contour survey.
- Study of curves.
- Plane table surveying.
- Study of minor instruments.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	03
Tutorial	-	-	-	

Prerequisite Course(s): Knowledge of Element of Surveying

COURSE CONTENT

Surveying- I

Semester-III

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Part [A] Introduction to surveying

No of Lect. – 8, Marks: 16

- a) Surveying- Definition, principle of surveying, various types of surveying.
- b) Bench mark and its types, reduced level, rise and fall method, height of instrument method.

Part [B] Leveling

- a) Instruments used in leveling, dumpy level, automatic level, types of leveling staves.
- b) Principal axes of dumpy level, reciprocal leveling curvature and refraction correction, distance to the visible horizon.
- c) Profile leveling: L - section and cross -sections.

Unit-II: Theodolite

No of Lect. – 8, Marks: 16

- a) Principal axes and temporary adjustments of transit theodolite.
- b) Uses of theodolite: measurement of horizontal angles, vertical Angles, magnetic bearings, measuring deflection angles.
- c) Theodolite Traversing: Computation of consecutive and independent co-ordinates, adjustments of closed traverse, Gales traverse by co-ordinate method,

Unit-III: Tachometry

No of Lect. – 8, Marks: 16

- a) Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points.
- b) Use of tachometry in surveying, contour, characteristics and uses, methods of interpolation, tachometric contour survey.

Unit-IV: Curves

No of Lect. – 8, Marks: 16

- a) Horizontal and vertical curves and their purposes.
- b) Simple circular curves - Elements and setting out by linear & angular methods.
- c) Compound curves -Elements and setting out of compound curves.
- e) Transition curves -Types and uses, Length of transition curves,
(No numerical problem to be asked).

Unit-V: Plane Table Survey

No of Lect. – 7, Marks: 16

- a) Objective and equipment required for plane table survey.
- b) Methods of plane tabling - radiation, intersection, traversing and resection.
- c) Advantages, disadvantages, limitations and errors of plane Table surveying.
- d) Minor instruments: Study and use of abney level, box sextant, digital planimeter.

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

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Soft Skills – III COURSE OUTLINE

Course Title	Short Title	Course Code
Soft Skills – III	SK-III	

Course Description: Through this course we have tried to prepare the students for the industry. Most companies test mathematical and logical ability through an aptitude test. This subject aims at working on these skills of a student through strategies formulae and practice exercises.

Lecture	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
	1	13	13	2

Prerequisite Course(s): Fundamental knowledge of high school mathematics.

COURSE CONTENT

Soft Skills – III

Semester-III

Teaching Scheme

Examination Scheme

Lecture: 1 hour / week

Internal Continuous Assessment (ICA): 50 Marks

Unit-I

Arithmetic-1

No. of Lect. – 3, Marks: 10

a. Basic Formulae

- i. Divisibility rules
- ii. Speed maths
- iii. Remainder theorem
- iv. Different types of numbers
- v. Applications

b. HCF, LCM and Linear Equations

- i. HCF – Successive division and prime factorization methods
- ii. LCM – Successive division and prime factorization methods
- iii. Applications
- iv. Linear Equations – Elimination method
- v. Substitution method

- vi. Applications

c. Averages and Mixtures

- i. Concept of average
- ii. Faster ways of finding it
- iii. The allegation method
- iv. Applications

Unit-II: Arithmetic-II

No of Lect. – 3, Marks: 10

a. Percentages

- i. Concept of percentage
- ii. Working with percentages
- iii. Applications

b. Profit and Loss

- i. Difference between cost and selling price
- ii. Concept of profit percentage and loss percentage
- iii. Applications

c. Time and Work

- i. Basic time and work formula
- ii. Relation between time and work
- iii. Applications

Unit-III: Arithmetic-III

No of Lect. –3, Marks: 10

a. Permutations and Combinations

- i. Sum rule of disjoint counting
- ii. Product rule of counting
- iii. Concept of factorial
- iv. Permutations
- v. Linear permutations
- vi. Combinations
- vii. Circular permutations
- viii. Applications

b. Probability

- i. Definition and laws of probability
- ii. Mutually exclusive events
- iii. Independent events
- iv. Equally likely events
- v. Exhaustive events
- vi. Cards

- vii. Dice
- viii. Applications

c. Time and Distance

- i. Speed
- ii. Conversion factors for speed
- iii. Average Speed
- iv. Moving Bodies – Passing, crossing and overtaking
- v. Relative speed
- vi. Boats and streams
- vii. Applications

Unit-IV: Non-Verbal Reasoning

No of Lect. 2,

Marks: 10

a. Analogies

- i. Examples
- ii. Applications

b. Classification

- i. Examples
- ii. Applications

c. Sequences

- i. Examples
- ii. Applications

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Unit-V: Analytical Reasoning

No of Lect. – 3, Marks: 10

a. Analytical Puzzles

- i. Classification puzzles
- ii. Ordering puzzles
- iii. Assignment puzzles
- iv. Applications

b. Letter and Number Series

- i. Different types of letter series
- ii. Different types of number series
- iii. Mixed Series

c. Coding and Decoding

- i. Letter coding
- ii. Number coding
- iii. Mixed coding
- iv. Odd man out
- v. Applications

Guide lines for ICA:

ICA will be based on credit tests and assignments submitted by the student in the form of journal.

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.

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STRENGTH OF MATERIALS

LAB COURSE OUTLINE

Course Title

Short Title Course Code

Strength of material

SOM

ICA (Term Work): 50 Marks

Semester-III

Course description:-

In this Laboratory course emphasis is given on determining properties of metals & solving numerical's on all the topics in lab hours.

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Practical	2	13	26	1

Lab course content:-

Group A (Practical exercise- Any five from list given below)

1. To determine tensile test on a metal.
2. To determine hardness of metal (mild Steel or aluminium).
3. Torsion test on mild steel rod.
4. To determine impact strength of steel. (By Izod test)
5. To determine impact strength of steel.(By Charpy test)
6. To determine Young's modulus of elasticity for beam materials simply supported at ends.
7. Shear test on metals.

Group B (Solve any five assignments.)

For each assignment two practical hours are assigned

1. Assignment 1

- a. To solve numerical based on Normal stress and strain, tensile, compressive and shear stresses Hooke's law.
- b. To solve problems based on deformation in prismatic, stepped, & composite members due to concentrated load & self-weight, Stress & strain in determinate and indeterminate members, temperature stresses.

2. Assignment 2

- a. To solve numerical based on shear stress & strain, modulus of rigidity, Poisson's ratio, bulk modulus, generalized Hooke's law, stress strain diagram.

b. To solve numerical based on strain energy, stresses due to various types of axial load using strain energy method.

3. Assignment 3

a. To solve problems based on shear force and bending moment for cantilevers, simple and compound beams due to concentrated, uniformly distributed, uniformly varying load and couples.

b. To solve problems based on construction of loading diagrams and bending moment diagram from shear force diagram.

4. Assignment 4

a. To solve numerical based on bending stresses in beams, moment of inertia, parallel and perpendicular axis theorem, section modulus, moment of resistance, bending stress distribution diagram.

b. To solve numerical based on bending stresses in beams for unsymmetrical section

5. Assignment 5

a. To solve numerical based on shear stresses in beams, shear stress derivation, and shear stress distribution in different cross sections of beams.

b. To 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.

6. Assignment 6

a. To solve problems based on axially loaded columns: Euler's theory of long columns, Rankine's formula.

b. To 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. To 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.

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.

CONCRETE TECHNOLOGY

LAB COURSE OUTLINE

Course Title

Short Title Course Code

Concrete Technology

CT

ICA (Term Work) : 25 Marks

ESE (Oral) : 25 Marks

Course description:-

In this Laboratory course emphasis is on the Knowing various tests on cement, sand, aggregates and concrete

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Practical	2	13	26	1

LAB COURSE CONTENT:-

1. Testing of Cement

a. Fineness of cement

To calculate fineness of cement given as per IS

b. Consistency of cement

To find consistency of cement given as per IS

c. Setting time of cement

To know initial and final setting time of cement given as per IS

d. Compressive strength of cement

To calculate Compressive strength s of cement given as per IS

e. Soundness of cement

To calculate soundness of cement given as per IS.

2. Testing of aggregates

a. Sieve analysis

To calculate fineness modulus and to perform sieve analysis and calculate Fineness modulus as per IS

b. Crushing value test

To calculate crushing value of aggregates as per IS

c. Impact value test

To calculate impact value of aggregates as per IS

d. Moisture content

To calculate Moisture content of aggregates as per IS

e. Abrasion test

To calculate abrasive value of aggregates as per IS

f. Shape test

To calculate flakiness and elongation index of aggregates as per IS

g. Specific gravity test

To calculate Specific gravity of aggregates as per IS

3. Test on concrete

a. workability test

To calculate workability of concrete by slump cone and compaction factor method as per IS.

b. Compressive strength (Cubes and cylinders)

To calculate compressive strength of concrete cubes and cylinders as per IS

c. Split test

To calculate tensile test of concrete cylinders as per IS

Guide Lines for ICA:-

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

Guide lines for ESE:-

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

Text 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.

BUILDING CONSTRUCTION TECHNIQUES AND MATERIALS

LAB COURSE OUTLINE

Course title:-Building Construction Techniques and Materials **Short title: -** BCT&M

Practical: 2Hours/Week

ICA (Term Work) : 25 Marks

ESE (Oral) : 25 Marks

Course description:-

In this Laboratory course emphasis is on the understanding of Building Construction Techniques and Materials

	Hours/ Week	No. Of weeks	Total Hours	Semester Credits
Practical	2	13	26	1

LAB COURSE CONTENT:-

1) Orthographic, isometric, oblique and axonometric view.

- To draw the various (2D & 3D) views of building.

2) C.C.T.W. panelled door: plan, elevation, section

- To know the various types doors and draw the sketches.
- To describe the various types windows and draw the sketches.

3) Flush door: plan, elevation and section

- To know the various types doors and draw the sketches.
- To describe the various types windows and draw the sketches.

4) Lintel/ Arches in stone and bricks.

- To know various types lintel and arches and draw the sketches

5) Stone masonry: U.C.R., C.R. and Ashlars.

- To study various types of bonds 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. and draw the sketches

6) Bonds in brick masonry with isometric view for one bond for one brick.

- To describe and draw sketches of brick, brick bats and their various views.

7) Different types of roofs.

- To study king post and queen post roofs and draw the sketches.

8) Steel trusses

- To know steel trusses methods of connections, and their connecting materials, tubular structure used as a truss and draw the sketches.

9) Types of stairs.

- To study the Circulation: Horizontal and vertical, stair and staircase planning and design, types of staircase as per shape and material used, type of circulation and draw the sketches

10) Report regarding visit to the construction sites including drawing and photographs. (Minimum two visits are mandatory).

11) Market survey (Including rates)

- Prepare the report of market survey for different building materials.

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

Guide Lines for ICA:-

ICA shall be based on continuous evaluation of student performance throughout the semester and 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.

- b) Describe the method to fill the data into a field book.
- c) Explain the errors which are eliminated by repetition method.
- d). Verification of check by repetition method.

4. Computation of horizontal distances and elevations by Tachometry for horizontal and inclined sights.

- a. Study about multiplying constant and additive constant of tachometer.
- b. Measurement of stadia hair readings.
- c. Calculation of horizontal distance with respect to instrument station.
- d. Calculation of vertical elevation with respect to line of collimation.
- e. Calculation of reduced level when station is in depression and elevation.

5. Radiation and intersection method in plane Table survey.

- a. Study about different accessories of plane table survey.
- b. Sketch the layout of site by radiation method
- c. Measurement of two point distance by intersection method.
- d. Verification of distance by taping

6. Use of box sextant, Abney level and digital plan meter.

- a. Study of minor instruments in surveying
- b. Describe working and construction.

Group B (Projects)

Project-1:- Theodolite Traverse survey project of a closed traverse with at least four sides.

- a. Fixing location of station by chaining and offsetting.
- b. Measurement of horizontal angle between station by repetition method
- c. Measurement of distance between station points and buildings corner points by taping.
- d. Measurement of bearing of station points by prismatic compass.
- e. Balancing the traverse at four corner points by Bowditch rule.
- f. Drawing the sketch of traverse by applying suitable scale.

Project-2:- Tachometric contouring project with at least two instrument stations at 60 m apart.

- a. Study about multiplying constant and additive constant of tachometer.
- b. Divide the readings in requisite angle.
- c. Measurement of stadia hair readings.
- d. Calculation of horizontal distance with respect to instrument station.
- e. Calculation of vertical elevation with respect to line of collimation.

- f. Calculation of reduced level when station is in depression and elevation.

Project-3:- Road project for minimum length of 200m, including fixing of alignment, profile leveling, and cross sectioning.

- a. Reconnaissance survey of site for selection of alignment of road
- b. Fixing the alignment on ground by chaining, taping and offsetting at suitable interval.
- c. Measurement of staff readings on ground points
- d. Calculation of cutting and filling from RL calculation by HI and rise and fall method
- e. Drawing the profile of ground and formation line of alignment by applying suitable scale.

Project-4:- Plane table survey project of a closed traverse of minimum four sides

- a. Fixing location of station by chaining and offsetting.
- b. Measurement of horizontal distance between station points and buildings corner points by taping.

The **Term Work** will consist of:

- (i) Field book containing record of all exercises and projects listed above.
 - (ii) File of full imperial size drawing sheets as mentioned below
- 1) Theodolite Traverse survey project. 1 sheet
 - 2) Tachometric contouring project.....1 sheet
 - 3) Road project showing L- section, plan of road and typical cross -section.....Min -1 sheet
 - 4) Plane Table Traverse survey project.....1 sheet

Guidelines for ICA :

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

Guide lines for ESE:-

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

REFERENCES 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

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

**Second Year Engineering
(CIVIL ENGINEERING)**

Faculty of Engineering and Technology



COURSE OUTLINE

SEMESTER – IV

W.E.F 2013 – 2014

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SE (Civil) : Semester - IV

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory	Tutorial	Practical	Total	Theory		Practical		Total	
						ISE	ESE	ICA	ESE		
Hrs / week	Hrs / week	Hrs / week									
Engineering Geology	* A/D	3	---	---	3	20	80	---	---	100	3
Fluid Mechanics I	D	3	1	---	4	20	80	---	---	100	4
Theory of Structures I	D	3	1	---	4	20	80	---	---	100	4
Building Design & Drawing	D	3	---	---	3	20	80	---	---	100	3
Surveying II	D	3	---	---	3	20	80	---	---	100	3
Computer Graphics in Civil Engineering lab	B	1	---	2	3	---	---	50	---	50	2
Engineering Geology lab	D	---	---	2	2	---	---	50	---	50	1
Fluid Mechanics I lab	D	---	---	2	2	---	---	25	25	50	1
Building Design & Drawing lab	D	---	---	2	2	---	---	25	25	50	1
Surveying II lab	D	---	---	2	2	---	---	25	25(PR)	50	1
Total		16	2	10	28	100	400	175	75	750	23

ISE: Internal Sessional Examination
ICA: Internal Continuous Assessment

ESE: End Semester Examination

Note 1: For branches like Chemical Engineering and Biotech Engg, two laboratory hours can be merged to form a four hour slot. Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

*** E & TC, Mechanical, Automobile & Production Engineering branches shall have group D course and rest of the branches shall have group A course (e.g. Engineering Mathematics-III).**

MyUniversityBuzz

ENGINEERING GEOLOGY

COURSE OUTLINE

Course Title

Short Title Course Code

Engineering Geology

EG

Course Description:

This course is designed to enable students to evaluate, to apply and to analyze the relevant geological principles. In this course, the related topics on rock types/classifications, geological structures and geological processes are covered. The principles of Structural geology are introduced mainly to highlight the relevancy of engineering properties of geological materials in designing rock engineering projects. At the end of the course, students acquainted with related knowledge and principles in geology and can be able to apply these knowledge and principles in designing safe and economic engineering structures in rock masses.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	03

Prerequisite Course(s): Elements of Civil Engineering.

Course content

Engineering Geology

Semester-IV

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Mineralogy & Petrology

No of Lecture: 7 Hours, Marks: 16

1. Introduction to the subject: - Objects, scope, rock forming minerals, primary and secondary minerals.
2. Silicate and non silicate minerals', felsic and mafic minerals, essentials and accessories minerals.
3. Origin, texture, structure, classification of igneous rocks, secondary rocks, metamorphic rocks and their engineering applications,
4. Study of common rock types prescribed in practical work.

Unit-II: Structural Geology, Plate Tectonics & Ground water

No of Lect.- 8 Hours, Marks: 16

- a) Structural geology: Outcrop, dip and strike, conformable series, unconformity and overlap.
- b) Faults and their types, folds and their types, inliers and outliers.
- c) Structural features resulted due to igneous intrusions, concordant and discordant igneous intrusions
- d) Joints and their types and Introduction to plate tectonics.
- e) Water table and depth zones, relation between surface relief and water table, perched water table
- f) Natural springs and seepages, contact springs, hot springs and geysers, artesian wells.

Unit-III: Geomorphology, Historical Geology & Building stones

No of Lect. – 8, Marks: 16

- a) Geomorphology: geological action of river, rejuvenation, land forms resulted due to river erosion, deposition and rejuvenation.
- 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 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.
- d) Earthquake & its causes, classification, seismic zones of india & geological consideration for constructions of building.

Unit-IV: Preliminary Geological Studies, Remote function, Geo physical exploration.

No of Lect. – 8, Marks: 16

- a) Verification of surface data by subsurface exploration, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts, etc.
- b) Compilation and interpretation of information obtained from these. correlation of surface data with results of subsurface exploration.
- c) Limitations of drilling, comparative reliability of data obtained by drilling and excavation.
- d) Engineering significance of geological structures such as stratification, dips, folds, faults, joints, crush zones, fault zones, dykes etc.
- e) Landslides and its causes, preventive measures and case studies.
- f) Principles of geo physical exploration methods for sub surface survey.

Unit-V: Role of Engineering Geology in Dams and tunneling.

No of Lect. – 8, Marks: 16

- a) Preliminary geological investigation for tunnels. important geological consideration while choosing alignment
- b) Role of groundwater, geological conditions likely to be troublesome, suitability of common rock type for tunneling, unlined tunnels, case studies.
- c) Geological requirements for construction of dams and geological structures influence of geological condition on the choice of type and design of dam.
- d) Preliminary geological work on dam sites, favorable and unsuitable geological conditions for locating a dam, precaution to be taken to counteract unsuitable condition
- e) Treatment of leaky rocks, faults, dykes, crush zones, joints, fractures, unfavorable dips, etc. and case studies.

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 Candigarh.

FLUID MECHANICS I

Course Outline

Course Title

Short Title Course Code

FLUID MECHANICS I

FM-I

General Objective:

The general objective of course is to teach fluid and flow properties and to analyze and solve fluid problems under static and dynamic conditions. Also it aims to explain flow measurement in pipes, open channels and tanks and to introduce dimensional analysis and similitude to students.

Course Description:

This course provides the elementary level knowledge of Fluid mechanics which includes:-

- Study of Fluid properties.
- Fluid statics – Fluid pressure, buoyancy and floatation and their civil engineering applications.
- Kinematics and dynamics of fluid flow.
- Dimensional analysis and hydraulic similitude.
- Analysis of laminar flow in pipes and measurement of viscosity of liquids.
- Flow measurement by Venturimeters, Pitot tubes, orifices, mouthpieces, weirs and notches.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	13	39	3
Tutorial	1	13	13	1

Prerequisite Course(s):

Mathematics (calculus and differential equations), statics and dynamics. Ability to (i) draw free body diagrams, (ii) solve dynamics problems using Newton's laws of motion.

COURSE CONTENT

Fluid Mechanics- I Semester-IV

Teaching Scheme Scheme

Lecture: 3 hours / week

Examination

End Semester Examination (ESE) : 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit I

No. of lectures: 07, Marks: 16

- A) **Introduction:** - Scope and applications of fluid mechanics, Newton's law of viscosity, classification of fluids: Newtonian and non-Newtonian fluids, ideal and real fluids.
- B) **Physical properties of fluids** – Mass density, specific weight, specific volume, specific gravity, dynamic and kinematic viscosities, compressibility, surface tension, capillarity, vapour pressure.

Unit II - Fluid statics

No. of lectures: 08, Marks: 16

- A) **Fluid pressure measurement:** - Fluid pressure, pressure head, measurement of pressure: - Simple and differential manometers, introduction to mechanical gauges.
- B) **Pressure on surfaces:** - Static fluid pressure forces on plane and curved surfaces and their simple civil engineering applications.
- C) **Buoyancy:** - Archimedes's principle, buoyancy and flotation, metacentric height, stability of floating and submerged bodies.

Unit III

No. of lectures: 09, Marks: 16

- A) **Kinematics of fluid flow-** Types of fluid flows:–Steady and unsteady; uniform and non uniform; laminar and turbulent; one, two and three dimensional; rotational and irrotational flows. Velocity & acceleration for one and three dimensional flows. Stream lines, equipotential lines and flow net, uses and limitations of flow net. Equations of continuity for one and three-dimensional flows.
- B) **Dynamics of fluid flow** – 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. Simple applications of continuity and Bernoulli's equations such as Pitot tube and Venturimeter. Introduction to linear momentum principle.

Unit IV

No. of lectures: 07, Marks: 16

- A) **Dimensional analysis and Hydraulic similitude:**– Dimensions of physical quantities, dimensional homogeneity, Buckingham pi-theorem.
Model analysis: 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.
- B) **Laminar flow:** – Laminar flow through pipes- Hagen-Poiseuille's equation, Stoke's law. Mention of various methods of measurement of viscosity. Reynolds's experiment, transition from laminar to turbulent flow.

Unit V

No. of lectures: 08, Marks: 16

- A) **Flow through opening – Orifices:** Types, coefficients of velocity, contraction and discharge, small and large orifices, completely submerged orifices.
Mouthpieces: Types, external cylindrical mouthpiece.

B) **Flows over notches and weirs** – Rectangular, triangular and trapezoidal notches and weirs, Cipolletti weir, empirical formulae for discharge over rectangular weirs, corrections for velocity of approach and end contractions.

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.

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THEORY OF STRUCTURE – I

Course outline

Course Title	Short Title	Course code
Theory of Structures-I	TOS-I	

Course Description:

The object of the subject to analyze statically determinate and indeterminate structures such as beams, trusses and arches subjected to external loads. Course focuses on different analytical tools for understanding the behavior of primarily, statically determinate structures, and also of indeterminate structures. It includes computation of deflections, internal axial forces, shear forces, and bending moments in simple trusses, beams, frames and arches. The study of influence line diagram includes identification of positions of load for maximum shear force and bending moments at specified sections.

Lecture	Hours/Week	No. of weeks	Total Hours	Semester Credits
	03	13	39	04
Tutorial	1	13	13	

Course Content

Theory of structures-I

Semester-IV

Teaching Scheme

Examination Scheme

Lecture: 3 hours / week

End Semester Examination (ESE) : 80 Marks

Tutorial: 1 hour / week

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

UNIT-I

(09 Hours, 16 marks)

a) Deflection of Beams: -

Relation between BM, slope and deflection, Introduction to double integration method, Concept of moment area method, Mohr's theorems, Use of moment area method to calculate slope and deflections of beams such as simply supported, over hanging and of uniform cross sections and different cross sections. Conjugate beam method, Application of conjugate beam method to simply supported, overhanging and compound beams.

b) Strain Energy:- Castiglino's first theorem and its application to find slope & deflection of simple beams and frames.

UNIT-II

(07 Hours, 16 marks)

a) Deflection of trusses: -

Deflection of statically determinate plane trusses by Castiglino's first theorem

b) Analysis of redundant trusses by Castiglino's second theorem, lack of fit and temperature changes in members, sinking of supports (degree of indeterminacy maximum upto 2 only).

UNIT-III

(08 Hours, 16 marks)

a) Fixed Beams:- Concept, advantages and disadvantages, Nature of B.M. Diagrams, Fixed end moment due to various types of loads such as point, uniformly distributed, Uniformly varying, couples for beams, Effect of sinking of support, plotting of B.M. & S.F. diagrams.

b) Continuous Beams: - Analysis of continuous beam by three moment (Clapyeron's theorem) up to three unknowns, Effect of sinking of supports, plotting of B.M. & S.F. diagrams.

UNIT-IV

(07 Hours, 16 marks)

b) Three hinged arch: - Concept of three hinged arch as a haunched beam, support reactions, B.M., S.F. and axial thrust diagrams for circular and parabolic three hinged arches.

b) Two hinged arches:-

Horizontal thrust at supports. Shear, normal thrust and BM at a point, BM diagrams for parabolic arch due to concentrated load and udl.

UNIT-V

(08 Hours, 16 marks)

a) Influence lines: - Basic concepts, influence line for reactions, B.M. & S.F. for simply supported, overhanging beams, Calculations for S.F. & B.M. in beam using influence lines.

b) Moving loads: - Introduction, conditions for maximum B.M. and maximum S.F. at a section due to moving point loads, udl longer or shorter than span and train of moving loads, Absolute maximum B.M. & S.F., Construction of Max. S. F. and B.M. diagram.

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. Indererminate structures by C.K.Wang

BUILDING DESIGN AND DRAWING

COURSE OUTLINE

Course Title

Short Title Course Code

Building Design and Drawing

BDD

Course Description:

This course introduces the student about concepts in building design and drawing such as building definition, types of building, principle of planning, building rules, regulations and byelaws, building ventilation and air-conditioning, necessity of fire protection system, different building services with its importance like electrical, communications, plumbing, solar water heater, planning and designing of residential buildings of load bearing and frame structures, planning and designing of apartments (flats), one point and two point perspective drawings, Planning and designing of various public building buildings.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	03

Prerequisite Course(s): Engineering graphics, Building construction techniques and materials

COURSE CONTENT

Building Design and Drawing

Semester-IV

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 04 Hours

Internal Sessional Exam (ISE) : 20 Marks

Unit-I

No. of Lect. – 8, Marks: 16

1. Introduction:-

Building definition and types of building as per occupancy, principles of planning of residential buildings, plan sanctioning procedure, building bye laws & its necessity.

2. Ventilation and Air conditioning of buildings:-

Ventilation: -Necessity of ventilation, functional requirements, systems of ventilation and their choice, movement of wind through building, wind effect etc.

Air conditioning: - Classification, comfort and comfort conditions, principles and system of comfort, object and necessity of air conditioning.

3. Fire protection: - Fire load, fire safety, grading of occupancy by fire load, considerations in fire protection, fire resistant construction & wall openings, fire escape elements.
4. Building services: Its importance, constructional requirements for different building services-like electrical, Tele communication service & plumbing services : Layout of water supply and drainage system, one pipe and two pipe system, storage & disposal arrangement, septic tank, garbage disposal arrangements, solar water heater.

Unit-II

No of Lect. – 7, Marks: 16

- a) Planning and designing of residential buildings (load bearing or frame Structure)
- b) Working drawings: - importance and use of all types of working drawings at site.

Unit-III:

No of Lect. – 8, Marks: 16

- a) Planning and designing of apartment houses(flats) (framed Structure only)
- b) Perspective drawings : one point and two point perspective drawings

Unit-IV:

No of Lect. – 8, Marks: 16

- a) Planning and designing of Educational buildings, hostel buildings, library buildings, Restaurants, Hotels/lodging-boarding buildings, and primary health centers/hospitals. (frame Structure only)

Unit-V:

No of Lect. – 8, Marks: 16

- a) Planning and designing of bus stand buildings, commercial complex buildings, bank buildings, post office buildings, Community/marriage halls, factory buildings. (frame Structure only)

Note: 1) Theory questions shall be asked on **Units I.**

2) Only drawing questions shall be asked to draw on drawing sheets from **Unit II, III, IV & V**

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

COURSE OUTLINE

Course Title

Short Title Course Code

Surveying- II

SUR-II

Course Description:

This course introduces the students about concepts in Surveying such as:

- Scope of geodetic surveying and triangulation in civil Engineering society.
- Adjustment of triangulation figure by using different methods
- Terrestrial and Aerial photography for large scale survey
- Distortion and displacement in photography
- Principles of remote sensing and its methods
- Locating of sounding in hydrographic surveying
- Importance and principles of electronic distance meters

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	13	39	03
Tutorial	-	-	-	

Prerequisite Course(s): Surveying- I

Course content

Surveying- II

Semester-IV

Teaching Scheme

Lecture: 3 hours / week

Examination Scheme

End Semester Examination (ESE) : 80 Marks

Paper Duration (ESE) : 03 Hours

Internal Sessional Exam (ISE) : 20 Marks

Unit-I: Geodetic Surveying:

No of Lect. – 8, Marks: 16

- a) Objects, methods in geodetic surveying
- b) Triangulation figure, Strength of figure, Classification of triangulation system

- c) Selection of stations, intervisibility of height of station towers, signal and their classification
- d) Phase of signals , satellite station and Reduction to centre Eccentricity of signals
- e) Base line measurement, Apparatus used, Base net; equipment used for base line measurement, Extension of a base.

Unit-II: Triangulation Adjustments.

No of Lect. – 8, Marks: 16

- a) Kinds of errors; laws of weights,
- b) Determination of the most probable values of quantities; The method of least squares; Indirect observations on independent quantities; normal equation; conditioned quantities
- c) The probable error and its determination ; distribution of error to the field measurements ,
- d) Method of correlates, station adjustment and figure adjustment;
- e) Adjustment of a geodetic triangle , figure adjustment of a triangle ; calculation of spherical triangle ;
- f) Adjustment of geodetic quadrilateral, Adjustment of a quadrilateral with a central station by method of least squares.

Unit-III: Photogrammetry

No of Lect. – 8, Marks: 16

- a) Objects ; application to various fields, terrestrial photogrammetry (only general idea) and aerial photogrammetry ;
- b) Aerial camera;
- c) comparison of map and vertical photograph ;
- d) Vertical tilted and oblique Photographs ;
- e) Concept of principal point nadir point, isocentre, horizon point and principal plane,
- f) Scale of vertical photograph; computation of length and height from the photograph;
- g) Relief displacement on vertical photograph;
- h) Flight planning; ground control ; radial line method;
- i) Mirror and lens Stereoscopes.

Unit-IV: Hydrographic Surveying

No of Lect. – 8, Marks: 16

- a) Objects; establishing controls; shore line survey, river surveys;
- b) Soundings, tide gauges, Equipment for taking soundings; signals.
- c) Nautical sextant; measuring horizontal and vertical angles with the nautical sextant,
- d) Sounding party, ranges making the soundings, methods of locating the soundings ;reduction of soundings ,
- e) The three point problem and methods of solution.

Unit-V: Remote Sensing**No of Lect. – 7, Marks: 16**

- a) Basic principles, importance, scope,
- b) Sensors used in remote sensing, platforms,
- c) Applications of remote sensing to Civil Engineering.

Use of advance electronics instruments in Surveys:-

- a) Study and use of various electronics equipments like EDM and Total station.

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

MyUniversityBuzz

COMPUTER GRAPHICS IN CIVIL ENGINEERING

Course outline

Course Title	Short Title	Course Code
Computer Graphics	CG	

Course Description:

AutoCAD stands for Automatically Computer Aided Drafting/Designing. It is an electronic tool that enables you to make quick and accurate drawings with the use of a computer. Unlike the traditional methods of making drawings on a drawing board, with CAD you can sit back in an easy chair and create wonderful drawings just by clicking the buttons of a keyboard. Moreover, drawings created with CAD have a number of advantages over drawings created on a drawing board. CAD drawings are neat, clean and highly presentable. Electronic drawings can be modified quite easily and can be presented in a variety of formats.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	01	13	13	-

Prerequisite Course(s): Basic Knowledge of Computer.

Course Content

Computer Graphics

Semester-IV

Teaching Scheme

Lecture: 1 hour/ week

Unit-I

Introduction to AutoCAD (Automatically Computer Aided Drafting/Designing)

No of Lectures: 7 Hours

- Introduction to CAD, Introduction to drafting software.
- Explanation to precision Drawing & Drawing tools, Geometric Shapes, Basic Printing, Editing Tools. .

Unit-II

Engineering and Architectural Views

No of Lect.- 6Hours

- Engineering and Architectural Views, Drafting Views, Layers, Templates & Design Center, Dimensioning, Blocks
- Office Standards, Drafting symbols, Introduction to 3D.

COMPUTER GRAPHICS IN CIVIL ENGINEERING

Lab course outline

Course Title	Short Title	Course Code
Computer Graphics	CG LAB	

ICA (Term Work) : 50 Marks

Course Description:

In this laboratory course emphasis is given on understanding the practical oriented knowledge related to civil engineering software AutoCAD and their applications used for drawing .

Practical	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	13	26	02

Total Semester Credits: 2

Prerequisite Course(s): Basic knowledge of Computer.

Lab course content

Term Work

Term Work shall consist of drawings on A4 size sheets of the following

- 1) Practice assignments on CAD drafting tools (Min. 2 Assignments). (06 Hours)
 - a) Hands on practice on Basic AutoCAD software.
 - b) One drawing showing use of Basic CAD commands.
 - c) One Drawing sheet showing various objects such as Circle, Arc, Rectangle, Ellipse, Polygon, Chamfer, Mirror etc.
 - d) Familiar with AutoCAD interface commands

- 2) Detailed Plan of 2 BHK house. (12 Hours)
 - a) Foundation plan.
 - b) Typical Floor Plan.
 - c) Elevations.
 - 1) Drawing of 2BHK Plan (Separate plan for individual should be drawn)
 - 2) A foundation plan of drawn 2BHK showing various column footings.
 - 3) Elevation of floor plan showing various structural elements of building.
 - 4) Drawing of sectional elevation passing through a staircase

- 3) Detailed drawing of structural elements from given data. (8 Hours)
 - a) Detailing of RCC isolated column footing
To draw RCC Isolated Column Footing showing each component as per data given.

b) Detailing of RCC column and beam.

Drawing of RCC Column & Beam showing each component description as per data given.

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.

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ENGINEERING GEOLOGY LAB

Lab course outline

Semester-IV

Course Title	Short Title	Course Code
Engineering Geology	EG LAB	

ICA (Term Work): 50 Marks

Course Description:

In this laboratory course emphasis is given on understanding the practical oriented knowledge related to civil engineering and their applications in the field.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	13	26	1

Total Semester Credits: 1

Prerequisite Course(s): Elements of Civil Engineering

Lab Course Content

Following experiments are to be performed. Term works shall consist of journal giving details of the experiments performed.

1. Identification of following minerals in hand specimens.
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.
 - a. To know chemical composition of mineral.
 - b. To know Mohs Scale of Hardness of standard minerals.
 - c. To identify colour, streak, cleavage, fracture, luster, hardness, crystal form etc.
 - d. To identify special property of mineral
 - e. Identify mineral name based on physical properties.
2. Identification of following different rock types in hand specimens.
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.
 - a. To know colour, texture/structure of rock specimen
 - b. To identify mineral composition of rock specimen
 - c. Based on mineral composition classify rock specimen.

- d. Identify rock name based on properties.
3. Construction of geological section from contoured geological maps.
 - a. To draw geological section from geological contour map.
 - b. To identify various structural features such faults, folds, joints, dykes etc. from the section.
 - c. To identify the nature of topography below the ground level.
4. Interpreting geological features without drawing section
 - a. To identify geological features without drawing section
 - b. Identifying faults, folds, joints, divisional planes etc.
5. Solution of engineering geological problems such as alignment of dam, tunnels, roads, canals, bridges, etc. based on geological maps.
 - a. To draw the geological section from contour geological map
 - b. To find out the solution of geological problems based on geological maps.
 - c. To find the alternative solution or exact solution related to geological problems.
6. Logging of drill core and interpretation of drilling data with graphical representation of core log.
 - a. To represent the Core-Box data in the form of Core-log & representing the same in the form of Graph by using Litholog OR
 - b. To solve Numerical based on core data with graphical representation of core-log.
7. One site visit is desirable to study geology and its engineering applications, submission of field report.
 1. To get acquainted with various geological structural phenomenons, one site visit is important.
 2. Can get knowledge of faults, folds, dykes, joints etc. in the context of geology & its applications on engineering point of view.
 3. Beneficial for determining amount of dip, apparent dip in the field.

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.

FLUID MECHANICS I LAB

Lab course content

(Note: All practical exercise in each group.)

Course Title	Short Title	Course Code
Fluid Mechanics I Lab	FM I lab	
	ICA (Term Work)	: 25 Marks
	ESE (Oral)	: 25 Marks
	Semester-IV	

Course Description:

This laboratory covers experiments related to measurement of fluid and flow properties and basic principles of statics, kinematics and dynamics of fluid flow. These include:-

- Measurement of viscosity of liquids.
- Measurement of fluid pressure by manometers.
- Buoyancy and floatation.
- Study of Bernoulli's theorem.
- Measurement of discharge using Venturimeter, orifice and notch.
- Study of flow net by electrical analogy method.
- Study of laminar flow in Reynolds apparatus / Heleshaw's apparatus.
- Study of momentum principle.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Laboratory	2	13	26	1

General Objective:

In this laboratory students will be introduced to the applications of basic principles of fluid mechanics to measure fluid and flow properties such as viscosity, pressure, discharge in pipes, open channels and tanks. Also students are introduced to verification and simple applications of equations of continuity, energy and momentum.

Objective to develop following Intellectual skills:

1. To understand basic laws of fluid statics and equations of energy and momentum and to apply the same to solve problems.
2. To learn use of Venturimeter, orifice, notch for discharge measurement.
3. To identify principles and working of different apparatus in laboratories.

Objective to develop following Motor skills:

1. Ability to draw diagrams of equipments and graphs.

2. Ability to perform the experiments and record the observations of pressure, weight, temperature, volume, time, discharge, voltage and current etc.
3. Ability to apply various discharges and measure the corresponding effects.
4. Ability to apply the basic principles in various field conditions.

Outline of Content: These experiments contain

1. Measurement and study of variation of viscosity of oil with temperature.

- 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.

2 Study of simple and differential manometers.

- 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.

3 Buoyancy: metacentric height of ship model.

- 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.

4 Study of Bernoulli's theorem.

- 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.

5 Calibration of Venturimeter.

- 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.

6 Electrical analogy method.

- a. To identify equipotential lines by observing equal voltage at different points and

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

Note: The Term Work will consist of a laboratory journal consisting of eight experiments/assignments. At least eight out of 11 experiments/assignments should be performed.

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 outline

Semester-IV

Course Title

Building Design and Drawing

Short Title

BDD

Course Code

Practical: 2 Hours/Week

ICA (Term Work)

: 25 Marks

ESE (Oral)

: 25 Marks

Course Description:

In this laboratory course emphasis is on the planning, design and drawing of various class buildings.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	13	26	1

Total Semester Credits: 1

Prerequisite Course(s): Engineering Graphics, Building construction techniques

Lab course content

Group A

- a. Planning of a small residential buildings/bungalow/duplex from given data (load bearing or framed structure).**
 - a. Draw furniture arrangement
 - b. Draw front elevation, sections (preferably through staircase)
 - c. Site plan, built up area calculations
 - d. Schedules of area & openings.
- b. Perspective view of plan drawn in sheet no- 1 with suitable scale**
 - a. Draw real perspective view of residential building in sheet No. 1

Group B

Project work

Project work shall consist of preparation of working drawings after planning and designing of any one building mentioned in Unit II, III, IV & V. Every student shall select different type mentioned in above units; individual work is expected from the students.

1. Layout plan of project building

- a. Showing internal roads ,other structures (if any) Compound walls
- b. Entrance gate, garden, electrical Line & poles, Tree plantation etc. (project sheet no -1)

2. Typical floor plans.

- a. Draw all details units of each floor.

3. Foundation Plan

- a. Draw all foundation details

4. Front and Road side elevations

- a. Draw all detail elevation with elegance

5. Sections.

- a. Draw section through staircase and toilet with all constructional details

6. Layout plan showing water supply and drainage arrangements

- a. Draw plan showing water supply line from municipal connection to various required tap connections within project building

7. Drawings-

- a. Layout/Floor plan and elevation using computer drafting software on A4 size sheets.
- b. Assembly & dissembling of starter.
- c. Connection of starter according to wiring diagram.

8. Line plans –

- a. Various public buildings. (any five types) using computer drafting software on A4 size Sheets.

9. Visit report-

- a. 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)

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 be 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 outline

Semester-IV

Course Title	Short Title	Course Code
Surveying- II LAB	SUR-II LAB	

ICA (Term Work) : 25 Marks
ESE (Oral) : 25 Marks

Course Description:

It covers experiments related to measurement of horizontal angle, vertical angle, oblique angle, horizontal distance by using 1” theodolite . Use of nautical sextant, stereoscope and EDM/ Total station.

Practical	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	13	26	1

Total Semester Credits: 1

Prerequisite Course(s): Surveying-1

Lab course content

- 1. Measurement of horizontal and vertical angles by One Second Theodolite**
 - a. Study the component parts of One Second Theodolite.
 - b. Measurement of horizontal angles by face left and right position.
 - c. Measurement of vertical angles by face left and right position.

- 2. Measurement of horizontal angles by reiteration method.**
 - a. Measurement of horizontal angles by face left and right position.
 - b. Verification of check by reiteration method.

- 3. Study and use of mirror stereoscope and finding out the air base distance**
 - a. Find out the location of principal point on photograph
 - b. Fix the photograph along the line of principal point and conjugate principal point
 - c. Measurement of air base distance by mirror stereoscope

- 4. Hydrographic survey**
 - i) Study and use of nautical sextant for measurement of angles.**
 - ii) Solution of three point problem.**
 - a. Study of components parts of nautical sextant
 - b. Measurement of horizontal, vertical and oblique angle
 - c. Find out the location of station point by three well defined points (three point problem)

- 4. Measurement of angles and elevation by Total Station / Study and use of E.D.M**

- a. Study of components parts of total station
- b. Measurement of horizontal and vertical angles by total station
- c. Measurement of vertical elevation by total station
- d. Measurement of horizontal distance by total station.

Note: The practical examination will be based on the above exercises.

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 field book.

Guide lines for ESE:-

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

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