# Learning Outcomes based Curriculum Framework (LOCF)

For

B. Tech. (Civil Engineering)

2022-23 Onward

Syllabi for 2nd year (Semester 3 & 4)

Faculty of Engineering and Technology

Chaudhary Devi Lal University Sirsa-125055

# Scheme of Examination & Detailed Syllabus of B.Tech (CE) 2nd Year

# (3rd & 4thSemester)

| Course Code | Definition/ Category |
|---|---|
| BSC | Basic Science Courses |
| ESC | Engineering Science Courses |
| HSMC | Humanities and Social Sciences including Management Courses |
| MC | Mandatory Audit Courses |
| PC | Program Core |
| PE | Program Elective Courses |
| OE | Open Elective Courses |
| EEC | Employability Enhancement Courses (Project work/ Summer Training/ Industrial Training/ Practical Training/ Internship/Seminar, etc.) |

# Scheme B.Tech. (Civil Engineering) 2nd year

| SEMESTER-3 | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Workload/Credit** | | | |
| | | **Theory** | **Tutorial** | **Practical/Drawing** | **Total** |
| *MC/2-T | Environmental Science | 3/- | - | - | 3/- |
| BSC/7-T | Mathematics-III | 3/3 | - | - | 3/3 |
| PC/CE/1-T | Structural Analysis-I | 3/3 | 1/1 | - | 4/4 |
| PC/CE/2-T | Fluid Mechanics-I | 3/3 | 1/1 | - | 4/4 |
| PC/CE/3-T | Surveying-I | 3/3 | 1/1 | - | 4/4 |
| PC/CE/4-T | Building Construction, Materials & Drawing | 3/3 | - | 2/1** | 5/4 |
| PC/CE/1-P | Structural Analysis-I Lab | - | - | 2/1 | 2/1 |
| PC/CE/2-P | Fluid Mechanics-I Lab | - | - | 2/1 | 2/1 |
| PC/CE/3-P | Surveying-I Lab | - | - | 2/1 | 2/1 |
| **Total** | | **18/15** | **3/3** | **8/4** | **29/22** |
| **SEMESTER-4** | | | | | |
| **Course Code** | **Course Title** | **Workload/Credit** | | | |
| | | **Theory** | **Tutorial** | **Practical/Drawing** | **Total** |
| HSMC/3-T | Fundamentals of Management | 3/3 | - | - | 3/3 |
| PC/CE/5-T | Structural Analysis-II | 3/3 | - | - | 3/3 |
| PC/CE/6-T | Fluid Mechanics-II | 3/3 | 1/1 | - | 4/4 |
| PC/CE/7-T | Soil Mechanics | 3/3 | 1/1 | - | 4/4 |
| PC/CE/8-T | Surveying-II | 3/3 | 1/1 | - | 4/4 |
| PC/CE/9-T | Engineering Geology | 3/3 | - | - | 3/3 |
| PC/CE/6-P | Fluid Mechanics-II Lab | - | - | 2/1 | 2/1 |
| PC/CE/7-P | Soil Mechanics Lab | - | - | 2/1 | 2/1 |
| PC/CE/8-P | Surveying-II Lab | - | - | 2/1 | 2/1 |
| PC/CE/9-P | Geology –Lab | - | - | 2/1 | 2/1 |
| **Total** | | **18/18** | **3/3** | **8/4** | **29/25** |
| | | | | | |
| ***EEC/CE/1 | 2-4 Week Survey Camp | -/- | -/- | -/4 | -/4 |

*Non-credit qualifying mandatory course.
** Internal evaluation.
*** The students shall devote 2-4 Weeks to Survey Camp (EEC/CE/1) after 4th semester examinations and shall submit a report. The evaluation of survey camp will be taken up in the 5th semester.

Note: Students will be allowed to use non-programmable scientific calculators only; however, sharing of calculator should not be permitted.

| | | | | |
|---|---|---|---|---|
| **Course code** | **MC/2-T** | | | |
| **Category** | **Mandatory Courses** | | | |
| **Course title** | **Environmental Sciences** | | | |
| **Scheme and credits** | **L** | **T** | **Credits** | |
| | **3** | **0** | **0.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course Outcomes**

**By the end of the course students will be able to:**

CO1. Enhance and analyze human impacts on the environment.

CO2. Integrate concepts & methods from multiple discipline and apply to environmental problems.

CO3. Design and evaluate strategic terminologies and methods for subs table management of environmental systems.

CO4. Create knowledge on various local environment aspects which forms an irreplaceable tool in the entire learning process.

**Course Contents**

**UNIT-I**

Multidisciplinary nature of Environmental studies: Definition, scope and importance, need for public awareness; Concept, Structure and function of an ecosystem: Producers, consumers and decomposers, Energy flow in the ecosystem ,Ecological succession ,Food chains, Food webs and ecological pyramids; Introduction, types, characteristics features, structure and function of Forest ecosystem, Grassland ecosystem ,Desert ecosystem, Aquatic ecosystem (Ponds, Stream, lakes, rivers, oceans, estuaries); Biodiversity: Introduction, Definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and option values; Biodiversity at global, national and local level, India as a mega-diversity nation, Hot-spot of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT-II**

Renewable and non-renewable resources, Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people; Water resources: Use and over utilization of surface and ground water, floods, droughts conflicts over water, dams benefits and problems; Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources; Food resources:

World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity; Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies; Land resources: Land as a resource, land degradation, main induced landslides, soil erosion and desertification, Role of an individual in conservation of natural resources, Equitable use of resources for suitable lifestyle.

**UNIT-III**

Definition of Environment Pollution; Causes, effects and control measures of: Air Pollution, Water Pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes effects and control measures of urban and industrial wastes; Role of and individual in prevention of pollution, Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies; different laws related to environment: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.; Issues involved in enforcement of environmental legislation, Public awareness

**UNIT-IV**

Social issues and the Environment: From unsustainable to Sustainable development, Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problem and concern, case studies; Environment ethics: Issues and possible solutions; Wasteland reclamation; Consumerism and waste products; Human Population growth, variation among nation, Population explosion- Family Welfare Programme, Environment and human health , Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

**Books**


1. Fundamental concepts in Environmental studies by Dr. D.D. Mishra. S. Chand publications.
2. Essentials of Ecology and Environmental Science by Dr. S. V.S. Rana, PHI Learning Pvt. Ltd, Delhi
3. Environmental Chemistry by Anil Kumar De, Wiley Eastern Limited.
4. Environmental Science by T.G. Miller, Wadsworth Publishing Co, 13th edition.
5. Ecology and Environment by P. D. Sharma, Rastogi publications


**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | - | - | - | - | - | 1 | 3 | - | - | - | - | - |
| CO2. | - | - | - | - | - | 1 | 3 | - | - | - | - | - |
| CO3. | - | - | - | - | - | 1 | 3 | - | - | - | - | - |
| CO4. | - | - | - | - | | 1 | 3 | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **BSC/7-T** | | | |
| **Category** | **Basic Science Courses** | | | |
| **Course title** | **Mathematics-III** | | | |
| **Scheme and credits** | **L** | **Tu** | **Credits** | |
| | **3** | **0** | **3.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Pre-requisites:** Mathematics I and Mathematics II

**About the Course**

This is an advanced mathematics course that offers the knowledge of Fourier Series, Fourier Transforms, Functions of Complex Variables. These concepts are essential for students to solve problems in image processing, digital signal processing and other related engineering fields.

**Course Outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Define concepts and terminology of Fourier series and Fourier transforms, Functions of complex variables, Power Series and, Probability distributions and hypothesis testing. | **L1 (Remembering)** |
| CO2. | Solve problems using Fourier transforms in domains like digital electronics and image processing. | **L3 (Apply)** |
| CO3. | Apply mathematical principles to solve computational problems | **L3 (Apply)** |
| CO4. | Compare various probability distributions | **L4 (Analysis)** |
| CO5. | Select suitable hypothesis testing methods for given problems and interpret the respective outcomes. | **L5 (Evaluating)** |
| CO6. | Integrate the knowledge of Fourier series and Fourier transforms, Functions of complex variables, Power Series and, Probability distributions and hypothesis testing for solving real world problems. | **L6 (Creating)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Course Content**

**Unit I**

Fourier Series and Fourier Transforms: Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

**Fourier integrals,** Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac delta function.

**Unit II**

**Linear Programming Problem (LPP)**: Introduction; Formulation of linear programming problem (LPP); Graphical method for its solution; Standard form of LPP; Basic feasible solutions; Simplex Method and Dual Simplex Method for solving LPP.

**Unit III**

**Functions of Complex Variable:** Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations.Harmonic functions.

**Complex integral,** Cauchy Gaursat theorem (without proof), Cauchy integral formula (without proof), Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series.Zeroes and singularities of complex functions, Residues.Evaluation of real integrals using residues (around unit and semi-circle only).

**Unit IV**

**Probability Distributions** : Probability, Baye's theorem, Discrete & Continuous probability distributions, Moment generating function, Probability generating function, Properties and applications of Binomial, Poisson and normal distributions.

T**ext and Reference Books:**


1. F. Kreyszig, *Advanced Engineering Mathematics*, 10th edition, Wiley, 2015.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 44th edition, 1965.
3. R. K. Jain, S.R.K. Iyenger. *Advance Engineering. Mathematics*, 4th edition, Narosa Publishing House, 2012.
4. Michael D. Greenberg, *Advanced Engineering Mathematics*, 2nd edition, Pearson Education, 2002.
5. Johnson and Miller *Probability and statistics for Engineers*, 8th edition, Pearson Education India, 2015.


## CO-PO Mapping:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 1 | - | - | - | - | - | - | - | - | - | - | - |
| CO2. | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - |
| CO3. | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - |
| CO4. | 2 | 3 | 2 | 3 | - | - | - | - | - | - | - | - |
| CO5. | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | - |
| CO6. | 3 | 3 | 2 | 3 | - | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| **Course code** | **PC/CE/1-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Structural Analysis-I** | | | |
| **Scheme and credits** | **L** | **T** | **Credits** | |
| | **3** | **1** | **4.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Basic application of mechanics involved commonly in the structures. | **L1(Remembering)** |
| CO2. | Get the desired values of the resultant action in response to the agitation on the structures. | **L2(Understanding)** |
| CO3. | Various techniques to analyse the structures following the slope and deflection approach. | **L3(Applying)** |
| CO4. | Analysis of trusses or forces in each member of trusses using simplified approach. | **L4(Analyzing)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Course Content:**

**Unit-I**

**Introduction:** Concept of Equilibrium, General Equilibrium equations, concept of free body diagrams, Concept of stress and strain, Hooke's law, Stress-strain curve of steel and concrete, compound and composite bars, thermal stresses.

**Centroid:** Introduction and significance, Centroid of regular shapes, Symmetrical sections, Unsymmetrical sections, hollow sections.

**Moment of Inertia:** Parallel axis theorem, Perpendicular axis theorem, Mass moment of inertia, Area moment of inertia of regular shapes: L-sections, T-sections, I-sections, Moment of inertia of unsymmetrical sections, hollow sections.

**Analysis of stresses and strains:**

Analysis of simple states of stresses and strains, elastic constraints, bending stresses, theory of simple bending, flexure formula, combined stresses in beams, shear stresses, Mohr's circle, Principle stresses and strains.Torsion in shafts and closed thin walled sections, stresses and strains in cylindrical shells and spheres under internal pressure.

**Unit-II**

**Bending moment and shear force in determinate beams and frames:**

Types of load on beam and frames, classification of beams, shear force and bending moment diagrams: simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed and varying load and moment, relationship between load, shear force and bending moment.

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**Three hinged arches:**

Arch subjected to any combination of point loads, uniformly distributed and varying load and moment, calculating Horizontal thrust, radial shear force and bending moment diagrams.

**Unit-III**

**Deflections in beams:**

Introduction, slope and deflections in beams by differential equations, moment area method and conjugate beam method, unit load method, Principle of virtual work, Maxwell's Law of Reciprocal Deflections.

**Unit-IV**

**Theory of Columns:**

Slenderness ratio, end connections, short columns, Euler's critical buckling loads, eccentrically loaded short columns, cylinder columns subjected to axial and eccentric loading.

**Analysis of statically determinate trusses:**

Introduction, various types, stability, analysis of plane trusses by method of joints and method of sections. Analysis of space trusses using tension coefficient method.

**TEXT BOOK:**

1 Strength of Materials Part-I, S.Timoshenko, Affiliated East-West Press, New.Delhi

**REFERENCE BOOKS:**

1 Mechanics of Solids, Prasad, V. S. Gakgotia Pub., New Delhi.
2 Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
3 Elementary Structural Analysis, Wibur&Nooris, McGraw Hill Book Co., Newyork.
4 Structural Analysis, Bhavikatti S.S.,VikasPub.House, N.Delhi.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| CO2. | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - |
| CO3. | 1 | 3 | 1 | - | - | - | - | - | - | - | - | - |
| CO4. | 1 | 3 | 1 | - | | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| **Course code** | **PC/CE/2-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Fluid Mechanics-I** | | | |
| **Scheme and credits** | **L** | **T** | **Credits** | |
| | **3** | **1** | **4.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Basic properties of fluids and its application. | **L1(Remembering)** |
| CO2. | Various conditions in respect to the flow of fluids and the concept of floating bodies. | **L2(Understanding)** |
| CO3. | Flow measuring techniques and equipments with theories of fluid flow. | **L3(Applying)** |
| CO4. | Formation of hydraulic models and modules and dimension analysis of fluids | **L4(Analyzing)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

## Unit-I

**Introduction:**
Fluid properties, mass density, specific weight, specific volume and specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility viscosity, Newtonian and Non-Newtonian fluids, real and ideal fluids.

**Fluid Statics:**
Pressure-density-height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, center of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.

## Unit-II

**Kinematics of Fluid Flow:**
Steady& unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional. Flows, stream lines, streak lines and path lines, continuity equation in differential form,

rotation and circulation, elementary explanation of stream function and velocity potential, rotational and irrotational flows, graphical and experimental methods of drawing flow nets.

## Unit-III

**Dynamic of Fluid Flow:**
Euler's equation of motion along a streamline and its integration, limitation of Bernoulli's equation, Pitot tubes, Venturimeter, Orifice meter, flow through orifices & mouth pieces, sharp crested weirs and notches, aeration of Nappe.

**Dimensional Analysis and Hydraulic Similude:**
Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modeling, similar and distorted models.

## Unit-IV

**Laminar Flow:**
NavierStoke's equation, Laminar flow between parallel plates, Couette flow, laminar flow through pipes-Hagen Poiseuille law, laminar flow around a sphere-Stokes' Law.

**Drag and Lift:**
Types of drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil.

**TEXT BOOK:**

1 Hydraulic and Fluid Mechanic by P.N.Modi&S.M.Seth
2 Fluid Mechanics by Dr. R. K. Bansal.

**REFERENCE BOOKS:**

1 Introduction to Fluid Mechanics by Robert W.Fox& Alan T.McDonald
2 Fluid Mechanics through Problems by R.J.Garde
3 Engineering Fluid Mechanics by R.J.Garde&A.G.Mirajgaoker

**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| CO2. | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - |
| CO3. | 1 | 3 | 1 | - | - | - | - | - | - | - | - | - |
| CO4. | 1 | 3 | 1 | - | | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| **Course code** | **PC/CE/3-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Surveying-I** | | | |
| **Scheme and credits** | **L** | **T** | **Credits** | |
| | **3** | **1** | **4.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks. | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Use of basic instruments for measurement of distances and angles with corrective measures. | **L3(Applying)** |
| CO2. | Able to understand the procedure of determining the height of a particular point from mean sea level and to plot the ground features on the sheet. | **L2(Understanding)** |
| CO3. | Learn the use of digital and accurate instruments to determine the angles and to locate various points on the line. | **L1(Remembering)** |
| CO4. | Learn the need of locating curves on the highways etc. in the plane areas and at the hills. | **L4(Analyzing)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Unit-I**

**Introduction to Surveying:** Definition, importance, Objectives, History of surveying and mapping, Importance, Maps and maps Numbering systems, Maps, Scale, Principles of survey, Classification of surveys, different techniques of surveying.

**Chain Surveying:** Ranging, Chaining, Offsets, Errors in Chaining, Corrections to length measured with a tape.

**Compass Surveying:** Purpose of compass surveying, Comparison of compass surveying and chain surveying, Dip, Magnetic Declination, W.C.B., Q.B., and R.B

Plane Table Surveying: Introduction to plane table surveying, principle, instruments, working operations, setting up the plane table, centering, leveling, Orientation, methods of plane table survey, danger circle, Lehmann's Rules, errors in plane tabling.

**Unit-II**

**Leveling:** definitions of terms used in leveling, different types of levels, parallax, staves, adjustments, bench marks, classification of leveling, booking and reducing the levels, rise and fall method, line of collimation method, errors in leveling, permanent adjustments, Two peg test, reciprocal leveling, Corrections to curvature and refraction, cross sections and longitudinal leveling.

**Trigonometrically Leveling:** Introduction, height and distances-base of the object accessible, base of object inaccessible, Geodetical observation, refraction and curvature, axis signal correction, difference in elevation between two points.
**Contours:** Definition, representation of reliefs, horizontal equivalent, contour interval, characteristics of contours, methods of contouring, contour gradient, uses of contour maps.

**Unit-III**
**Theodolite and Theodolite Traversing:**
Theodolites, temporary adjustment of theodolite, measurement of angles, repetition and reiteration method, traverse surveying with theodolite, checks in traversing, adjustment of closed traverse, examples.
**Tacheometry:**
Uses of tacheometry, principle of tacheometric surveying, instruments used in tacheometry, systems of tacheometric surveying-stadia system fixed hair method, determination of tacheometric constants, tangential systems, examples.

**Unit-IV**
**Curves:**
Classification of curves, elements of simple circular curve, location of tangent points-chain and tape methods, instrumental methods, examples of simple curves. Transition Curves-Length and types of transition curves, length of combined curve, examples.
**Vertical Curves:** Necessity and types of vertical curves.
**Triangulation:**
Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work of triangulation, triangulation computations

**TEXT BOOK:**
1 Surveying Vol.I& II by B.C.Punmia
2 Surveying by C. Venkatramaiah

**REFERENCE BOOKS:**
1 Surveying Vol.I by T.P.Kanitkar
2 Fundamentals of Surveying by S. K. Roy
3 Surveying and levelling by R. Subramaniam

**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 1 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| CO2. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| CO3. | 1 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| CO4. | 1 | 3 | 2 | - | | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| **Course code** | **PC/CE/4-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Building Construction, Materials and Drawing** | | | |
| **Scheme and credits** | **L** | **D** | **Credits** | |
| | **3** | **2** | **4.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Knowledge of components of structure under construction by different material with their advantages and disadvantages. | **L1(Remembering)** |
| CO2. | Learn about the different material required in the interior of a structure to make the structure safe and sound. | **L1(Remembering)** |
| CO3. | Compatible with the information about the bonding agents such as cement etc. | **L2(Understanding)** |
| CO4. | Information about timber, metals, plastic, paints and varnishes along with their properties. | **L1(Remembering)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Unit-I**

**A. CONSTRUCTION**

**Masonry Construction:**

Introduction, various terms used, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.

**Cavity and Partition Walls:**

Advantages, position of cavity, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall.

**Foundation:**

Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas, design of masonry wall foundation, introduction to deep foundations i.e. pile and pier foundations.

## Unit-II

**Damp-Proofing and Water-Proofing:**
Defects and causes of dampness, prevention of dampness, materials used, damp-proofing treatment in buildings, water proofing treatment of roofs including pitched roofs.

**Roofs and Floors:**
Floor structures, ground, basement and upper floors, various types of floorings.
Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc.

**Doors and Windows:**
Locations, sizes, types of doors and windows, fixures and fastners for doors and windows.

## Unit-III

**B.MATERIALS**

**Stones:**
Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone.

**Brick and Tiles:**
Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks.
Tiles: Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta.

**Limes, Cement and Mortars:**
Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements composition, types of cement, manufacturing of ordinary Portland cement, testing of cement, special types of cement, storage of cement.
Mortars: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

## Unit-IV

**Timber:**
Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, plywood, fiberboard, masonite and its manufacturing, important Indian timbers.

**Ferrous Metals:**
Definitions, manufacturing of cast iron, manufacturing of steel from pig iron, types of steel, marketable form of steel.

**Paints and Varnishes:**
Basic constituents of paints, types of paints, painting of wood, constituents of varnishes, characteristics and types of varnishes.

**Plastic:**
Definition, classification of plastics, composition and raw materials, manufacturing, characteristics and uses, polymerization, classification, special varieties.

**C. DRAWINGS**

**1. Typical drawings of:**

a) Cavity Wall
b) Bonds in brick work
c) Grillage foundation

**2. Preparation of building drawing mentioning its salient features including the following details:**

a) Ground floor plan
b) Two Sectional Elevations
c) Front and Side Elevations
d) Plan and Sectional Elevation of stair case, doors/ windows/ ventilators, floor and roof.

**TEXT BOOK:**

1 Building Construction, Sushil Kumar, Standard Pub., N. Delhi
2 Building Material, Rangawala

**REFERENCE BOOKS:**

1 Construction Engineering, Y.S. Sane
2 Building Construction, Gurcharan Singh, Standard Pub., N. Delhi.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | - | - | - | - | - | - | - | - | - | - | - |
| CO2. | 3 | - | - | - | - | - | - | - | - | - | - | - |
| CO3. | 3 | - | - | - | - | - | - | - | - | - | - | - |
| CO4. | 3 | - | - | - | - | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| **Course code** | **PC/CE/1-P** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Structural Analysis-I Lab** | | | |
| **Scheme and credits** | **L** | **P** | **Credits** | |
| | **-** | **2** | **1.0** | |
| **Course Assessment Methods** | **Course Assessment Methods (Internal: 50; External: 50)**<br><br>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.<br>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.<br>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.<br>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the Performa (attached herewith as Annexure II and III) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Conduct investigation on different structural elements. | **L3(Applying)** |
| CO2. | Apply appropriate techniques to analyze complex problems. | **L3(Applying)** |
| CO3. | Verify experimental and analytical behavior of structural elements. | **L4(Analyzing)** |
| CO4. | Recognize the behavior of construction materials. | **L4(Analyzing)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**LIST OF EXPERIMENTS:**

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. Deflections of a truss- horizontal deflection & vertical deflection of various joints of a pin-jointed truss.
4. Elastic displacements (vertical & horizontal) of curved members.
5. Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
6. Experimental and analytical study of behavior of struts with various end conditions.
7. To determine elastic properties of a beam.

8. Uniaxial tension test for steel (plain & deformed bars)
9. Uniaxial compression test on concrete & bricks specimens.

Note: At-least seven experiments are to be performed by students from the above list. The coursecoordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 1 | 2 | - | 3 | - | - | - | - | - | - | - | - |
| CO2. | 1 | 2 | - | 3 | - | - | - | - | - | - | - | - |
| CO3. | - | 2 | - | 3 | 1 | - | - | - | - | - | - | - |
| CO4. | - | 2 | - | 3 | 1 | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| **Course code** | **PC/CE/2-P** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Fluid Mechanics-I Lab** | | | |
| **Scheme and credits** | **L** | **P** | **Credits** | |
| | **-** | **2** | **1.0** | |
| **Course Assessment Methods** | **Course Assessment Methods (Internal: 50; External: 50)**<br><br>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.<br>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.<br>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.<br>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the Performa (attached herewith as Annexure II and III) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Basic properties of fluids and its application. | **L3(Applying)** |
| CO2. | Various conditions in respect to the flow of fluids and the concept of floating bodies. | **L3(Applying)** |
| CO3. | Flow measuring techniques and equipments with theories of fluid flow | **L4(Analyzing)** |
| CO4. | Formation of hydraulic models and modules and dimension analysis of fluids | **L4(Analyzing)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**LIST OF EXPERIMENTS:**

1 To determine meta-centric height of the ship model.
2 To verify the Bernoulli's theorem.
3 To determine coefficient of discharge for an Orifice-meter.
4 To determine coefficient of discharge of a venture-meter.
5 To determine the various hydraulic coefficients of an Orifice ($C_d$, Cc, Cv).
6 To determine coefficient of discharge for an Orifice under variable head.

7 To calibrate a given notch.
8 To determine coefficient of discharge for a mouth piece.
9 Velocity measurements by current meter, float, double float (demonstration only).
10 Experiment on Vortex formation (demonstration only).

Note: At-least seven experiments are to be performed by students from the above list. The coursecoordinator may also design and set experiments in addition to the above list/topic as per thescope and requirement of syllabus.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| CO2. | 1 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| CO3. | 1 | 2 | - | 3 | - | - | - | - | - | - | - | - |
| CO4. | - | 2 | 1 | - | 3 | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **PC/CE/3-P** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Surveying-I Lab** | | | |
| **Scheme and credits** | **L** | **P** | **Credits** | |
| | **-** | **2** | **1.0** | |
| **Course Assessment Methods** | **Course Assessment Methods (Internal: 50; External: 50)**<br><br>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.<br>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.<br>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.<br>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the Performa (attached herewith as Annexure II and III) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks. | | | |

**Course outcomes:**

| Sr. No | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Use of basic instruments for measurement of distances and angles with corrective measures. | **L3(Applying)** |
| CO2. | Able to understand the procedure of determining the height of a particular point from mean sea level and to plot the ground features on the sheet. | **L2(Understanding** |
| CO3. | Learn the use of digital and accurate instruments to determine the angles and to locate various points on the line. | **L2(Understanding** |
| CO4. | Learn the need of determining the distance between two inaccessible points. | **L2(Understanding** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**LIST OF EXPERIMENTS:**

1 Chain surveying: Chaining and chain traversing.
2 Compass traversing.
3 Plane tabling: methods of plane table surveying,.
4 To verify two point problem and three point problem.
5 Leveling: Profile leveling

6 Plotting of longitudinal section and cross sections.
6. Permanent adjustment of level.
7. Reciprocal leveling.
8. Contouring and preparation contour map.
9. Single Plane observation of Trigonometric Levelling
10. Two plane observation of Trigonometric Levelling

Note: At-least seven experiments are to be performed by students from the above list. The coursecoordinator may also design and set experiments in addition to the above list/topic as per thescope and requirement of syllabus.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| CO2. | 1 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| CO3. | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - |
| CO4. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

# SEMESTER –IV

| | | | | |
|---|---|---|---|---|
| **Course code** | **HSMC/3-T** | | | |
| **Category** | **Humanities, Social Sciences and Management Courses** | | | |
| **Course title** | **Fundamentals of Management** | | | |
| **Scheme and credits** | **L** | **T** | **Credits** | |
| | **3** | **0** | **3.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks. | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | To develop the basic understanding of the concept of management and functions of management. | **Level 3 (Applying)** |
| CO2. | The students will come to know about Human Resource management and Marketing management functions of management. | **Level 2 Understanding** |
| CO3. | Students will come to know about the production activities of any manufacturing organisations. | **Level 2 Understanding** |
| CO4. | To know that how finances are arranged and disbursed for all the activities of business organisations. | **Level 4 Analyzing** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Unit-I**

Concept of Management: Definitions, Characteristics, Significance, Practical Implications; Management Vs. Administration; Management- Art, Science and Profession; Development of Management Thoughts; Managerial Functions.

**Unit-II**

Concept of Human Resource Management: Human resource planning; Recruitment, Selection, Training and Development, Compensation; Concept of Marketing Management: Objectives and functions of Marketing, Marketing Research, Advertising, ConsumerBehavior.

**Unit-III**

Concept of Production Management, Production Planning and Control, Material management, Inventory Control, Factory location and Production Layout.

**Unit-IV**

Concept of Financial Management, Capital Structure and various Sources of Finance, Working Capital, Short term and long term finances, Capital Budgeting.

**TEXT BOOK:**

1. Principles and Practices of Management: R. S. Gupta, B. D. Sharma, N. S. Bhalla; Kalyani Publishers.
2. Organization and Management: R. D. Aggarwal; Tata McGraw Hill.

**REFERENCE BOOKS:**

1. Marketing Management: S. A. Sherlikar; Himalaya Publishing House.
2. Financial Management: I.M. Pandey; Vikas Publishing House.
3. Production Management: B. S. Goel; Himalaya Publishing House.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 1 | | - | - | - | - | - | - | 3 | - |
| CO2. | 3 | 2 | 1 | - | - | - | - | - | - | - | 3 | - |
| CO3. | 1 | 2 | 3 | - | - | - | - | - | - | - | 3 | - |
| CO4. | 1 | 2 | 3 | - | - | - | - | - | - | - | 3 | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **PC/CE/5-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Structural Analysis-II** | | | |
| **Scheme and credits** | **L** | **Tu** | **Credits** | |
| | **3** | **1** | **4.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks. | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Basic application of mechanics involved in complex structures. | **L1(Remembering)** |
| CO2. | Get the desired values of the resultant action in response to the agitation on the complex structures. | **L2(Understanding)** |
| CO3. | Various techniques to analyse the complex structures following different approach. | **L3(Applying)** |
| CO4. | Analysis of unsymmetrical structures and to determine the stresses in structures like cable and suspension bridges. | **L4(Analyzing)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Unit-I**

**Statically Indeterminate Structures:**
Introduction, Static and Kinematic Indeterminacies, Castigliano's theorems, Strain energy method, Analysis of frames with one or two redundant members using Castigliano's $2^n$ theorem.

**Unit-II**

**Slope deflection and moment Distribution Methods:**
Analysis of continuous beams & portal frames, Portal frames with inclined members.

**Unit-III**

**Column Analogy Method:**
Elastic centre, Properties of analogous column, Applications to beam & frames.

**Analysis of Two hinged Arches:**
Parabolic and circular Arches, Bending Moment Diagram for various loadings, Temperature effects, Rib shortening, Axial thrust and Radial Shear force diagrams.

**Unit-IV**

**Unsymmetrical Bending**

Introduction Centroidal principal axes of sections, Bending stresses in beam subjected to unsymmetrical bending, shear centre, shear centre for channel, Angles and Z sections.

**Cable and suspension Bridges:**

Introduction, uniformly loaded cables, Temperature stresses, three hinged stiffening Girder and two hinged stiffening Girder.

**TEXT BOOK:**


1. Statically Indeterminate Structures, C.K. Wang, McGraw Hill Book Co., New York.
2. Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.


**REFERENCE BOOKS:**


1. Indeterminate Structures, R.L. Jindal, S. Chand & Co., New Delhi.
2. Theory of Structures, Vol. I, S.P. Gupta &G.S.Pandit, Tata McGraw Hill, New Delhi.


**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| CO2. | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - |
| CO3. | 1 | 3 | 1 | - | - | - | - | - | - | - | - | - |
| CO4. | 1 | 3 | 1 | - | | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **PC/CE/6-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Fluid Mechanics-II** | | | |
| **Scheme and credits** | **L** | **T** | **Credits** | |
| | **3** | **1** | **4.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks. | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Basic flow conditions and their analysis with the help of fluid properties. | **L1(Remembering)** |
| CO2. | Various forces exerted on the floating and submerged bodies in fluids and application of internal forces of fluids. | **L2(Understanding)** |
| CO3. | Knowledge of different types of flow. | **L2(Understanding)** |
| CO4. | Formation, behaviour and response of pumps and turbines. | **L2(Understanding)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Unit-I**

**Flow through pipes:**

Types of flows-Reynold's experiment, shear stress on turbulent flow, boundary layer in pipes-Establishment of flow, velocity distribution for turbulent flow in smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes, Stanton and Moody's diagram. Darcy's Weisbach equation, other energy losses in pipes, loss due to sudden expansion, hydraulic gradient and total energy lines, pipes in series and in parallel, equivalent pipe, branched pipe, pipe networks, Hardy Cross method, water hammer.

**Boundary layer analysis:**

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control.

## Unit-II

**Flow in Open Channels:** Difference between pipe flow and channel flow, Types of channels, Classification of flows, Sub Critical and Supercritical Flows, Velocity distribution in channel.

Flow Measurement: Flow over notches and weirs, Pitot tube floats and current meters for velocity measurement, Flow over Spillways, Sluice gates, Free over fall flow.

**Unsteady flow and Hydraulic jump:** Froude number and types of hydraulic jump, Applications Jumps in channels. Unsteady flow equation, Pre jump and post jump depths, length of Hydraulic Jump and energy dissipation, Surges.

## Unit III

**Concepts of Specific energy and specific Force:** Specific energy and specific curve, Momentum Equation in open channels, Specific force & specific force curve Critical depth and its computation.

**Gradually Varied Flow:** Channel transitions, Non-uniform flow in open channels, Dynamic equation for GVF, Water surface profiles in channels of different slopes GVF flow computations. Design of Channels, Most efficient channel sections.

## Unit-IV

**Pumps and Turbines:**

Reciprocating pumps, their types, work done by single and double acting pumps. Centrifugal pumps, components and parts and working, types, heads of a pump-statics and manometric heads. Force executed by fluid jet on stationary and moving flat vanes, Turbines-classifications of turbines based on head and specific speed, component and working of Pelton wheel and Francis turbines, Cavitation and setting of turbines.

**TEXT BOOK:**

1 Hydraulics & Fluid Mechanics by P.N.Modi and S.M.Seth
**2** Fluid Mechanics by R. K. Bansal

**REFERENCE BOOKS:**

1 Flow in Open Channels by S.Subraminayam
2 Introduction to Fluid Mechanics by Robert N.Fox& Alan T.Macnold

**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| CO2. | 1 | 2 | 3 | - | - | - | - | - | - | - | - | - |
| CO3. | 1 | 3 | 1 | - | - | - | - | - | - | - | - | - |
| CO4. | 1 | 3 | 1 | - | | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| **Course code** | **PC/CE/7-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Soil Mechanics** | | | |
| **Scheme and credits** | **L** | **Tu** | **Credits** | |
| | **3** | **1** | **4.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks. | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No. | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Understand the soil composition, its formation and its classification. | **L2(Understanding)** |
| CO2. | Able to understand the compaction of soil under loading and comparing the theoretical values with the experimental ones. | **L4(Analyzing)** |
| CO3. | Learn how to analyse the stresses in the soils in the depth and to find the settlement of soils under loading. | **L3(Applying)** |
| CO4. | Knowledge to find out the shear strength in soils and to learn different theories of earth pressure. | **L1(Remembering)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Unit-I**

**Soil Formation and Composition**

Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, inter particle forces, soil structure, principal clay minerals.

**Basic Soil Properties**

Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.

**Classification of soils**

Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System.

**Unit-II**

**Permeability of Soils**

Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.

**Effective Stress Concept**

Principle of effective stress, effective stress under hydrostatic conditions, capillary rise in soils, effective stress in the zone of capillary rise, effective stress under steady state hydro-dynamic conditions, seepage force, quick condition, critical hydraulic gradient, two dimensional flow, Laplace's equation, properties and utilities of flownet, graphical method of construction of flownets, piping, protective filter.

**Unit-III**

**Compaction**

Introduction, role of moisture and compactive effect in compaction, laboratory determination of optimum moisture content, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.

**Compressibility and Consolidation**

Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande's graphical method of estimating pre-consolidation pressure, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, Construction period settlement, secondary consolidation.

**Unit-IV**

**Shear Strength**

Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, triaxial compression tests, drainage conditions and strength parameters, Vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

**Earth Pressure**

Introduction, earth pressure at rest, Rankine's active & passive states of plastic equilibrium, Rankine's earth pressure theory, Coulomb's earth pressure theory, Culmann's graphical construction, Rebhann's construction.

**TEXT BOOK:**


1 Basic and Applied Soil Mechanics by GopalRanjan, ASR Rao, New Age International (P)Ltd.Pub.N.Delhi.
2 Soil Mechanics and foundation engineering by Dr. K. R. Arora.


**REFERENCE BOOKS:**


1 Soil Engg. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Pub.,N.Delhi.
2 Engg.Properties of Soils by S.K.Gulati, Tata-McgrawHill,N.Delhi.
3 Geotechnical Engg. ByP.PurshotamRaj,TataMcgraw Hill.
4 Principles of Geotechnical Engineering by B.M.Das,PWS KENT, Boston.


**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| CO2. | 1 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| CO3. | 1 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| CO4. | - | 3 | 1 | 2 | - | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **PC/CE/8-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Surveying-II** | | | |
| **Scheme and credits** | **L** | **Tu** | **Credits** | |
| | **3** | **1** | **4.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks. | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Application of Trigonometry to find the location of the general features of the lar in their proper relative positions. | **L3(Applying)** |
| CO2. | Able to understand the errors generated in survey process and methods to rectify these. | **L2(Understanding)** |
| CO3. | Understand the theory of positions: Latitude and longitude of astronomical features. | **L2(Understanding)** |
| CO4. | Learn new techniques for ease of survey like aerial photographs, GIS and GPS. | **L3(Applying)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Unit-I**

**Survey Adjustment and Treatment of Observations:**

Types of errors, definition of weight of an observation, most probable values, law of accidental errors, law of weights, determination of probable error (different cases with examples) principle of least squares, adjustment of triangulation figures by method of least squares.

**Astronomy:**

Definitions of astronomical terms, star at elongation, star at prime vertical star at horizon, star at culmination, celestial coordinate systems, Napier's rule of circular parts, various time systems: sidereal, apparent, solar and mean solar time, equation of time-its cause.

**Unit-II**

**Introduction** GIS, GPS, DEM, DTED, Large scale mapping, small scale mapping, Components of GIS, Application of GIS in civil engineering

**Remote Sensing,** Fundamentals, EMS, RS System, Active and Passive radiation – Electromagnetic Radiation – Nomenclature, Reflectance, Transmission and Absorption, Thermal Emission – Plank's formula, Stefan – Boltzman Law, Wein's Displacement Law; Emissivity – Kirchoff's Law, Characteristics of Solar Radiant Energy, Application of remote sensing to various engineering fields.

**Unit-III**

**Interaction of EMR with Atmosphere** – Scattering, Refraction, Absorption, Transmission.Atmospheric Windows.

**Interaction of EMR with Earth Surface** – Spectral Reflectance Curves. Interaction of earth surface with EM radiation in visible, NIR, TIR and Microwave regions.Idealized & Real sequence of remote sensing.

**Unit-IV**

**Elements of Photo-grammetry:**

Introduction: types of photographs, types of aerial photographs, aerial camera and height displacements in vertical photographs, stereoscopic vision and stereoscopies, height determination from parallax measurement, flight planning.

**TEXT BOOK:**

1 Surveying Vol.2 by B.C.Punmia
2 Surveying Vol.3 by B.C.Punmia

**REFERENCE BOOKS:**

1 Surveying Vol2 by T.P.Kanitkar
2 Higher Surveying by A M Chandra

**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - |
| CO2. | 1 | 2 | 3 | 2 | - | - | - | - | - | - | - | - |
| CO3. | 2 | 2 | 1 | 3 | - | - | - | - | - | - | - | - |
| CO4. | - | 1 | 2 | 3 | 3 | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **PC/CE/9-T** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Engineering Geology** | | | |
| **Scheme and credits** | **L** | **T** | **Credits** | |
| | **3** | **-** | **3.0** | |
| **Course Assessment Methods** | **Internal Examination (30 marks):**<br>• Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.<br>• Class Performance will be measured through percentage of lectures attended (04 marks)<br>• Assignments, quiz etc. will have weightage of 06 marks. | | | |
| | **End semester examination (70 marks)**:<br>• Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.<br>• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units. | | | |

**Course outcomes:**

| Sr. No | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | To understand the danger of erosion, earthquake and volcano eruption etc | **L2(Understanding)** |
| CO2. | Distinguish geological formations. | **L2(Understanding)** |
| CO3. | Identify geological structures and processes for rock mass quality. | **L3(Applying)** |
| CO4. | Identify subsurface information and groundwater potential sites through geophysical investigation. | **L3(Applying)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**Unit-I**

**Introduction:**

Definition, object, scope and sub division of geology, geology around us. Interior of the earth.Importance of Geology in Civil Engineering projects.

**Physical Geology:**

The external and internal geological forces causing changes, weathering and erosion of the surface of the Earth.Geological work of ice, water and winds.Soil profile and its importance.Earthquakes and volcanoes.

**Unit-II**

**Mineralogy and Petrology:**

Definition of mineral and rocks. Classification of important rock forming minerals, simple description based on physical properties of minerals. Rocks of earth surface, classification of rocks. Mineral composition, Textures, structure and origin of Igneous, Sedimentary and Metamorphic rocks.Aims and principles of stratigraphy.Standard geological/stratigraphical time scale with its sub division and a short description based on engineering uses of formation of India.

**Structural Geology:**
Forms and structures of rocks. Bedding plane and outcrops Dip and Strike. Elementary ideas about fold, fault, joint and unconformity and recognition on outcrops.Importance of geological structures in Civil Engineering projects.

**Unit-III**

**Applied Geology:**
Hydrogeology, water table, springs and Artesian well, aquifers, ground water in engineering projects.Artificial recharge of ground water, Elementary ideas of geological investigations.Remote sensing techniques for geological and hydrological survey and investigation.Uses of geological maps and interpretation of data, geological reports.

**Suitability and stability of foundation sites and abutments:**
Geological condition and their influence on the selection, location, type and design of dams, reservoirs, tunnels, highways, bridges etc. Landslides and Hill-slope stability.

**Unit-IV**

**Improvement of foundation rocks:**
Precaution and treatment against faults, joints and ground water, retaining walls and other precautions.
Geology and environment of earth.

**TEXT BOOK:**

1. A Text Book of Geology by P.K. Mukherjee

**REFERENCE BOOKS:**

1 Physical and General Geology by S.K.Garg
2 Engineering and General Geology by Prabin Singh
3 Introduction of Physical Geology by A.Holmes.

**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 2 | - | 3 | 1 | - | - | - | - | - | - | - | - |
| CO2. | 2 | 3 | 3 | 2 | - | - | 1 | - | - | - | - | - |
| CO3. | 2 | 3 | 3 | 3 | - | - | 1 | - | - | - | - | - |
| CO4. | - | 2 | 2 | 2 | - | - | 1 | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **PC/CE/6-P** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Fluid Mechanics-II Lab** | | | |
| **Scheme and credits** | **L** | **P** | **Credits** | |
| | **-** | **2** | **1.0** | |
| **Course Assessment Methods** | **Course Assessment Methods (Internal: 50; External: 50)**<br><br>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.<br>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.<br>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.<br>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the Performa (attached herewith as Annexure II and III) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks. | | | |

**Course outcomes:**

| Sr. No | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Basic properties of fluids and its application. | **L2(Understanding)** |
| CO2. | Employ Various conditions in respect to the flow of fluids and the concept of floating bodies. | **L3(Applying)** |
| CO3. | Examine Properties and functioning of centrifugal pump. | **L4(Analyzing)** |
| CO4. | Determining the flow in various pipe fittings. | **L5(Evaluating)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**LIST OF EXPERIMENTS:**

1 To determine the coefficient of drag by Stoke's law for spherical bodies.
2 To study the phenomenon of cavitation in pipe flow.
3 To determine the critical Reynold's number for flow through commercial pipes.
4 To determine the coefficient of discharge for flow over a broad crested weir.

5 To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
6 To study the scouring phenomenon around a bridge pier model.
7 To study the scouring phenomenon for flow past a spur.
8 To determine the characteristics of a centrifugal pump.
9 To study the momentum characteristics of a given jet.
10 To determine head loss due to various pipe fittings.

Note: At-least seven experiments are to be performed by students from the above list. The coursecoordinator may also design and set experiments in addition to the above list/topic as per thescope and requirement of syllabus.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO2. | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO3. | 2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| CO4. | 2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **PC/CE/7-P** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Soil Mechanics Lab** | | | |
| **Scheme and credits** | **L** | **P** | **Credits** | |
| | **-** | **2** | **1.0** | |
| **Course Assessment Methods** | **Course Assessment Methods (Internal: 50; External: 50)**<br><br>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.<br>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.<br>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.<br>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the Performa (attached herewith as Annexure II and III) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks. | | | |

**Course outcomes:**

| Sr. No | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Understand the soil composition, its formation and its classification. | **L2(Understanding)** |
| CO2. | Application of the methods of determination of soil properties useful in various construction activities. | **L3(Applying)** |
| CO3. | Learn the response of water penetration in the soils and its behaviour to wet conditions under loading. | **L4(Analyzing)** |
| CO4. | Find out the shear strength in soils and to relate the theoretical theories. | **L5(Evaluating)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**LIST OF EXPERIMENTS:**

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:
   i) Sand replacement method

ii) Core cutter method

6. Proctor's compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained (UU) triaxial shear test of fine grained soil sample.

Note: At-least seven experiments are to be performed by students from the above list. The coursecoordinator may also design and set experiments in addition to the above list/topic as per thescope and requirement of syllabus.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO2. | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO3. | 2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| CO4. | 2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

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|---|---|---|---|---|
| **Course code** | **PC/CE/8-P** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Surveying-II Lab** | | | |
| **Scheme and credits** | **L** | **P** | **Credits** | |
| | **-** | **2** | **1.0** | |
| **Course Assessment Methods** | **Course Assessment Methods (Internal: 50; External: 50)**<br><br>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.<br>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.<br>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.<br>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the Performa (attached herewith as Annexure II and III) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks. | | | |

**Course outcomes:**

| Sr. No | Course outcomes<br>At the end of the course students will be able to: | RBT* Level |
|---|---|---|
| CO1. | Use of Theodolite for measurement of distances and angles with corrective measures. | **L3(Applying)** |
| CO2. | Use Tachometer and tacheometry to determining the height of a particular point and horizontal distance. | **L5(Evaluating)** |
| CO3. | Learn the use of Triangulation and plot the topographical map. | **L5(Evaluating)** |
| CO4. | Plot the Base line with different methods meant to provide accuracy in plotting. | **L5(Evaluating)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**LIST OF EXPERIMENTS:**

**Theodilite:**

**1.** Study of theodolite, measurement of horizontal angle.
2. Measurement of vertical angle.
3. Permanent adjustment.

**Tacheometry:**

**4.** Tachometric constants,
5. Calculation of horizontal distance and elevation with the help of Tacheometer.

**Curves:**

6. Setting of simple circular curves by off- set method: off -set from chord produced,
7. Setting of simple circular curves by off- set method: off -set from long chord.
8. Setting of simple circular curves by deflection angle Method.

**Triangulation:**

9. An exercise of triangulation
10. Base line measurement.

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

## CO-PO Mapping:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO2. | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO3. | 2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| CO4. | 2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |

| | | | | |
|---|---|---|---|---|
| **Course code** | **PC/CE/9-P** | | | |
| **Category** | **Professional Core Courses** | | | |
| **Course title** | **Geology Lab** | | | |
| **Scheme and credits** | **L** | **P** | **Credits** | |
| | **-** | **2** | **1.0** | |
| **Course Assessment Methods** | **Course Assessment Methods (Internal: 50; External: 50)**<br><br>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.<br>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.<br>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.<br>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the Performa (attached herewith as Annexure II and III) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks. | | | |

**Course outcomes:**

| **Sr. No** | **Course outcomes**<br>At the end of the course students will be able to: | **RBT* Level** |
|---|---|---|
| CO1. | Describe different types of ores and minerals | **L3(Applying)** |
| CO2. | Understand and distinguish the geological formations | **L2(Understanding)** |
| CO3. | Identify the geological structures and processes for rock mass quality. | **L3(Applying)** |
| CO4. | Define the subsurface information and groundwater potential sites through geophysical investigations. | **L4(Analyzing)** |

***Revised Bloom's Taxonomy Action verbs/Levels**

**LIST OF EXPERIMENTS:**

1 Introduction to Crystallography – Identification of Crystals.
2 Introduction of minerals and the study of Physical properties, Identification of Quartz and feldspars.
3 Identification of pyroxenes and Amphiboles and other silicates.
4 Identification of important economic minerals.
5 Identification of important ore deposits.
6. Identification of Igneous rocks.

7. Identification of Sedimentary rocks.
8. Identification of metamorphic rocks.
9. Structural geology- strike and dip, three and 3-point problems point problems.

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

**CO-PO Mapping:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO2. | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO3. | 2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| CO4. | 2 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| 3 –High 2-Medium 1-Low | | | | | | | | | | | | |