VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
CIVIL ENGINEERING BOARD
BE-CBCS SYLLABUS 2017-18 Scheme

TITLE OF THE COURSE: STRENGTH OF MATERIALS B.E., III Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV32**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: This course will enable students;

1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.
2. To know the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements.
3. To analyse and understand different internal forces and stresses induced due to representative loads on structural elements.
4. To analyse and understand principal stresses due to the combination of two dimensional stresses on an element and failure mechanisms in materials.
5. To evaluate the behavior of torsional members, columns and struts.

Module-1

Simple Stresses and Strain:

Introduction, Definition and concept and of stress and strain. Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self weight. Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, Elastic constants and their relationship.

L1, L2

Module-2

Compound Stresses: Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses

Thin and Thick Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lame's equation, radial and hoop stress distribution.

L2,L4

Module-3

Shear Force and Bending Moment in Beams: Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.

L2,L4

Module-4

Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft, combined bending and torsion.

Theories of Failure: Introduction, maximum principal stress theory (Rankine's theory), Maximum shearing stress theory (Tresca's theory), Strain energy theory (Beltrami and Haigh), and maximum strain theory (St. Venant's theory).

L2 ,L4

Module-5

Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections. Shear centre(only concept)

Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

L1,L2,L4

Course outcomes: After studying this course, students will be able;

1. To evaluate the strength of various structural elements internal forces such as compression, tension, shear, bending and torsion.
2. To suggest suitable material from among the available in the field of construction and manufacturing.
3. To evaluate the behavior and strength of structural elements under the action of compound stresses and thus understand failure concepts
4. To understand the basic concept of analysis and design of members subjected to torsion.
5. To understand the basic concept of analysis and design of structural elements such as columns and struts.

Text Books:

1. B.S. Basavarajaiah, P.Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition, 2010
2. Ferdinand P. Beer, E. Russell Johnston and Jr.John T. DeWolf "Mechanics of Materials", Tata McGraw-Hill, Third Edition, SI Units

Reference Books:

1. D.H. Young, S.P. Timoshenko " Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint 2014)
2. R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010
3. S.S. Rattan " Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013)
4. Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi.

TITLE OF THE COURSE: FLUIDS MECHANICS
B.E., III Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV33**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: The objectives of this course is to make students to learn:

1. The Fundamental properties of fluids and its applications.
2. Hydrostatic laws and application to practical problem solving
3. Principles of Kinematics and Hydro-Dynamics for practical applications
4. Basic design of pipes and pipe networks considering flow, pressure and its losses.
5. The basic flow rate measurements

Module-1

Fluids & Their Properties: Concept of fluid, Systems of units. Properties of fluid; Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension& Capillarity. Fluid as a continuum, Newton's law of viscosity (theory & problems).Capillary rise in a vertical tube and between two plane surfaces (theory & problems). Vapor pressure of liquid, compressibility and bulk modulus, capillarity, surface tension, pressure inside a water droplet, pressure inside a soap bubble and liquid jet. Numerical problems

Fluid Pressure and Its Measurements: Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth. Types of pressure. Measurement of pressure using simple, differential & inclined manometers (theory & problems). Introduction to Mechanical and electronic pressure measuring devices**.**

L2,L3

Module-2

Hydrostatic forces on Surfaces: Definition, Total pressure, centre of pressure, total pressure on horizontal, vertical and inclined plane

surface, total pressure on curved surfaces, water pressure on gravity dams, Lock gates. Numerical Problems.

Fundamentals of fluid flow (Kinematics): Introduction. Methods of describing fluid motion. Velocity and Total acceleration of a fluid particle. Types of fluid flow, Description of flow pattern. Basic principles of fluid flow, three-dimensional continuity equation in Cartesian coordinate system. Derivation for Rotational and irroational motion. Potential function, stream function, orthogonality of streamlines and equipotential lines. Numerical problems on Stream function and velocity potential. Introduction to flow net.

L2,L4

Module-3

Fluid Dynamics: Introduction. Forces acting on fluid in motion. Euler's equation of motion along a streamline and Bernoulli's equation. Assumptions and limitations of Bernoulli's equation. Modified Bernoulli's equation. Problems on applications of Bernoulli's equation (with and without losses).

Vortex motion; forced vortex, free vortex, problems Momentum equation problems on pipe bends.

Applications: Introduction. Venturimeter, Orificemeter, Pitot tube. Numerical Problems

L2,L4

Module-4

Orifice and Mouthpiece: Introduction, classification, flow through orifice, hydraulic coefficients, Numerical problems. Mouthpiece, classification, Borda's Mouthpiece (No problems).

Notches and Weirs: Introduction. Classification, discharge over rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs. Numerical problems. Ventilation of weirs, submerged weirs.

L1,L2,L4

Module-5

Flow through Pipes: Introduction. Major and minor losses in pipe flow. Darcy-Weisbach equation for head loss due to friction in a pipe. Pipes in series, pipes in parallel, equivalent pipe-problems. Minor losses in pipe flow, equation for head loss due to sudden expansion. Numerical problems. Hydraulic gradient line, energy gradient line. Pipe Networks, Hardy Cross method, Numerical problems.

Surge Analysis in Pipes: Water hammer in pipes, equations for pressure rise due to gradual valve closure and sudden closure for rigid and elastic pipes. Problems

L2 ,L4

Course outcomes: After successful completion of the course, the student will be able to:

1. Possess a sound knowledge of fundamental properties of fluids and fluid Continuum
2. Compute and solve problems on hydrostatics, including practical applications
3. Apply principles of mathematics to represent kinematic concepts related to fluid flow
4. Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications
5. Compute the discharge through pipes and over notches and weirs

Text Books:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi
3. S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi

Reference Books:

1. Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics",

Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008(Ed)
2. K Subramanya, “Fluid Mechanics and Hydraulic Machines”, Tata McGraw Hill Publishing Co. Ltd.
3. K Subramanya, “Fluid Mechanics and Hydraulic Machines-problems and solutions”, Tata McGraw Hill Publishing Co. Ltd.
4. J. F. Douglas, J. M. Gasoriek, John Swaffield, Lynne Jack, “Fluid Mechanics”, Pearson, Fifth Edition
5. 5. Mohd.Kaleem Khan, “Fluid Mechanics and Machinery”, Oxford University Press

TITLE OF THE COURSE: BASIC SURVEYING
B.E., III Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV34**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: This course will enable students to;

1. Understand the basic principles of Surveying
2. Learn Linear and Angular measurements to arrive at solutions to basic surveying problems.
3. Employ conventional surveying data capturing techniques and process the data for computations.
4. Analyze the obtained spatial data to compute areas and volumes and draw contours to represent 3D data on plane figures.

Module-1

Introduction: Definition of surveying, Objectives and importance of surveying. Classification of surveys. Principles of surveying. Units of measurements, Surveying measurements and errors, types of errors, precision and accuracy. Classification of maps, map scale, conventional symbols, topographic maps, map layout, Survey of India Map numbering systems.

Measurement of Horizontal Distances: Measuring tape and types. Measurement using tapes, Taping on level ground and sloping ground. Errors and corrections in tape measurements, ranging of lines, direct and indirect methods of ranging, Electronic distance measurement, basic principle. Booking of tape survey work, Field book, entries, Conventional symbols, Obstacles in tape survey, Numerical problems.

L1, L2

Module-2

Measurement of Directions and Angles: Compass survey: Basic definitions; meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments, declination. Quadrantal bearings, whole circle bearings, local attraction and related problems

Theodolite Survey and Instrument Adjustment: Theodolite and types, Fundamental axes and parts of Transit theodolite, uses of theodolite, Temporary adjustments of transit theodolite, measurement of horizontal and vertical angles, step by step procedure for obtaining permanent adjustment of Transit theodolite

L2,L3

Module-3

Traversing: Traverse Survey and Computations: Latitudes and departures, rectangular coordinates, Traverse adjustments, Bowditch rule and transit rule, Numerical Problems

Tacheometry: basic principle, types of tacheometry, distance equation for horizontal and inclined line of sight in fixed hair method, problems

L1, L2

Module-4

Leveling: Basic terms and definitions, Methods of leveling, Dumpy level, auto level, digital and laser levels. Curvature and refraction corrections. Booking and reduction of levels. Differential leveling, profile leveling, fly leveling, check leveling, reciprocal leveling, trigonometric leveling (heights and distances-single plane and double plane methods.)

L3,L4

Module-5

Areas and Volumes: Measurement of area – by dividing the area into geometrical figures, area from offsets, mid ordinate rule, trapezoidal and Simpson's one third rule, area from co-ordinates, introduction to planimeter, digital planimeter. Measurement of volumes- rapezoidal and prismoidal formula.

Contouring: Contours, Methods of contouring, Interpolation of contours, contour gradient, characteristics of contours and uses.

L2,L3

Course outcomes: After a successful completion of the course, the student will be able to:

1. Posses a sound knowledge of fundamental principles Geodetics
2. Measurement of vertical and horizontal plane, linear and angular dimensions to arrive at solutions to basic surveying problems.
3. Capture geodetic data to process and perform analysis for survey problems]
4. Analyse the obtained spatial data and compute areas and volumes. Represent 3D data on plane figures as contours

Text Books:

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni , Surveying and Leveling Part I, Pune Vidyarthi Griha Prakashan, 1988

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. – 2010
3. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi
4. A. Bannister, S. Raymond , R. Baker, "Surveying", Pearson, 7th ed., New Delhi

TITLE OF THE COURSE: ENGINEERING GEOLOGY B.E., III Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV35**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: This course will enable students;

1. To understand the internal structure and composition of the earth.
2. To comprehend the properties, occurrence and uses of minerals in various industries.
3. To learn about geo-morphological agents such as river, wind, sea waves, and their implications in implementing civil engineering projects.
4. To gain knowledge about the structures of the rocks and their considerations in the selection of site for dams, tunnels, bridges and highways.
5. To learn the application of Topographic maps, remote sensing and GIS in Civil engineering practices and natural resource management.

Module-1

Introduction: Application of Earth Science in Civil Engineering Practices, Understanding the earth, internal structure and composition.

Mineralogy: Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group (Glass); Feldspar Group (Ceramic wares and Flooring tiles); Kaolin (Paper, paint and textile); Asbestos (AC sheets); Carbonate Group (Cement) ; Gypsum (POP, gypsum sheets, cement); Mica Group (Electrical industries); Ore minerals - Iron ores (Steel); Chromite (Alloy); Bauxite (aluminum); Chalcopyrite (copper)

L1,L2

Module-2

Petrology: Formation, Classification and Engineering Properties. Rock as construction material, concrete aggregate, railway ballast, roofing, flooring, cladding and foundation. Deformation of rocks, Development of Joints, Folds, Faults and Unconformities. Their impact in the selection of sites for Dams, Reservoirs, Tunnels, Highways and Bridges, Rock Quality Determination (RQD), Rock Structure Rating (RSR),: Igneous Rocks - Granite, Gabbro, Dolerite, Basalt; Sedimentary rocks - Sandstone, Shale, Limestone, Laterite; Metamorphic rocks - Gneiss, Quartzite,Slate, Charnockite: Decorative stones - Porphyries, Marble and Quartzite

L2,L3.

Module-3

Geomorphology and Seismology: Landforms – Classification, Rock weathering, types and its effects on Civil Engineering Projects. Study of Geo-morphological

aspects in the selection of sites for Dams, Reservoirs, Tunnels, Highways and Bridges. Watershed management, Floods and their control,River valley, Drainage pattern – parameters and development; Coastlines and their engineering considerations.

Earthquake - Causes and Effects,, Seismic waves, Engineering problems related to Earthquakes, Earthquake intensity, Richter Scale, Seismograph, Seismic zones-World and India, Tsunami – causes and effects. Early warning system. Reservoir Induced Seismicity; Landslides – causes and their control

L2, L3, L5.

Module-4

Hydrogeology: Hydrological cycle, Occurrence of Groundwater in different terrains -Weathered, Hard and Stratified rocks; Determination of Quality aspects - SAR, RSC and TH of Groundwater. Groundwater Pollution, Groundwater Exploration-Electrical Resistivity and Seismic methods, Resistivity curves, Water Bearing Formations, Aquifer types and parameters - Porosity, Specific yield and retention, Permeability, Transmissibility and Storage Coefficient. Springs and Artesian Wells, Artificial Recharging of Groundwater, Sea water intrusion and remedies.

L4,L5

Module-5

Geodesy: Study of Topographic maps and Contour maps; Remote Sensing – Concept, Application and its Limitations; Geographic Information System (GIS) and Global Positioning System (GPS) – Concept and their use resource mapping. LANDSAT Imagery–Definition and its use. Impact of Mining, Quarrying and Reservoirs on Environment. Natural Disasters and their mitigation.

L2,L3, L5

Course outcomes: After a successful completion of the course, the student will be able to:

1. Students will able to apply the knowledge of geology and its role in Civil Engineering
2. Students will effectively utilize earth's materials such as mineral, rocks and water in civil engineering practices.
3. Analyze the natural disasters and their mitigation.
4. Assess various structural features and geological tools in ground water exploration, Natural resource estimation and solving civil engineering problems.
5. Apply and asses use of building materials in construction and asses their properties

Text Books:

1. P.K. Mukerjee, "A Text Book of Geology", World Press Pvt., Ltd. Kolkatta.
2. Parbin Singh, "Text Book of Engineering and General Geology", Published by S.K.Kataria and Sons, New Dehli

Reference Books:

1. Earthquake Tips - Learning Earthquake Design and Construction - C V R Murthy Published by National Information Centre of Earthquake Engineering, Indian Institute of Technology, Kanpur.
2. Dimitri P Krynine and William R Judd, "Principles of Engineering Geology and

Geotechnics", CBS Publishers and Distributors, New Delhi.
3. K V G K Gokhale, "Principles of Engineering Geology", BS Publications,Hyderabad.
4. M Anji Reddy, "Text book of Remote Sensing and Geographical Information System", BS Publications, Hyderabad.
5. Ground water Assessment, development and Management by K.R. Karanth, Tata Mc Graw Hills
6. K. Todd, "Groundwater Hydrology", Tata Mac Grow Hill, New Delhi.
7. D. Venkata Reddy, "Engineering Geology", New Age International Publications, New Delhi.
8. S.K Duggal, H.K Pandey and N Rawal, "Engineering Geology", McGraw Hill Education (India) Pvt, Ltd. New Delhi.
9. M.P Billings, "Structural Geology", CBS Publishers and Distributors, New Delhi.
10. K. S. Valdiya, " Environmental Geology",, Tata Mc Grew Hills.
11. M. B. Ramachandra Rao, "Outlines of Geophysical Prospecting- A Manual for Geologists", Prasaranga, University of Mysore, Mysore

TITLE OF THE COURSE: Building Materials and Construction B.E., III Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV36**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: This course will develop a student;

1. In recognizing the good materials to be used for the construction work
2. In investigation of soil condition, Deciding and design of suitable foundation for different structures
3. In supervision of different types of masonry
4. In selection of materials, design and supervision of suitable type of floor and roof.
5. To gain knowledge about doors, windows, plastering, painting, damp proofing, scaffolding, shoring, underpinning and to take suitable engineering measures.

Module-1

Building Materials: Stone as building material; Requirement of good building stones, Dressing of stones, Deterioration and Preservation of stone work. Bricks; Classification, Manufacturing of clay bricks, Requirement of good bricks. Field and laboratory tests on bricks; compressive strength, water absorption, efflorescence, dimension and warpage.

Cement Concrete blocks, Stabilized Mud Blocks, Sizes, requirement of good blocks.

Mortar: types and requirements. Timber as construction material

Fine aggregate: Natural and manufactured: Sieve analysis, zoning, specify gravity, bulking, moisture content, deleterious materials.

Coarse aggregate: Natural and manufactured: Importance of size, shape and texture. Grading of aggregates, Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests.

L1 L2

Module-2

Foundation: Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation , types of foundation , introduction to spread, combined , strap, mat and pile foundation

Masonry: Definition and terms used in masonry. Brick masonry, characteristics and requirements of good brick masonry, Bonds in brick work, Header, Stretcher, English, Flemish bond, Stone masonry, Requirements of good stone masonry, Classification, characteristics of different stone masonry, Joints in stone masonry. Types of walls; load bearing, partition walls, cavity walls

L1,L2

Module-3
Lintels and Arches: Definition, function and classification of lintels, Balconies, chejja and canopy. Arches; Elements and Stability of an Arch. **Floors and roofs:** Floors; Requirement of good floor, Components of ground floor, Selection of flooring material, Laying of Concrete, Mosaic, Marble, Granite, Tile flooring, Cladding of tiles. Roof;-Requirement of good roof, Types of roof, Elements of a pitched roof, Trussed roof, King post Truss, Queen Post Truss, Steel Truss, Different roofing materials, R.C.C. Roof. **L3**
Module-4
Doors, Windows and Ventilators: Location of doors and windows, technical terms, Materials for doors and windows, Paneled door, Flush door, Collapsible door, Rolling shutter, PVC Door, Paneled and glazed Window, Bay Window, French window. Ventilators. Sizes as per IS recommendations **Stairs:** Definitions, technical terms and types of stairs, Requirements of good stairs. Geometrical design of RCC doglegged and open-well stairs. **Formwork:** Introduction to form work, scaffolding, shoring, under pinning. **L2 L3 L5**
Module-5
Plastering and Pointing : purpose, materials and methods of plastering and pointing, defects in plastering-Stucco plastering, lathe plastering **Damp proofing**-causes, effects and methods. **Paints**- Purpose, types, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces. L4 L5
Course outcomes: After a successful completion of the course, the student will be able to: 1. Select suitable materials for buildings and adopt suitable construction techniques. 2. Adopt suitable repair and maintenance work to enhance durability of buildings.
Text Books: 1. Sushil Kumar "Building Materials and construction", 20th edition, reprint 2015,Standard Publishers 2. Dr. B.C.Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) ltd., New Delhi. 3. Rangawala S. C. "Engineering Materials", Charter Publishing House, Anand, India.
Reference Books: 1. S.K.Duggal, "Building Materials", (Fourth Edition)New Age International (P) Limited, 2016 National Building Code(NBC) of India 2. P C Vergese, "Buliding Materials", PHI Learning Pvt. Ltd 3. Building Materials and Components, CBRI, 1990, India 4. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007. 5. M. S. Shetty, "Concrete Technology", S. Chand & Co. New Delhi.

TITLE OF THE COURSE: BUILDING MATERIALS T ESTING LABORATORY B.E., III Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CVL37**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**

Credits – 02

Course Objectives: The objectives of this course is to make students to learn:

1. Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
2. Ability to function on multi-disciplinary teams in the area of materials testing.
3. Ability to use the techniques, skills and modern engineering tools necessary for engineering.
4. Understanding of professional and ethical responsibility in the areas of material testing.
5. Ability to communicate effectively the mechanical properties of materials.

Experiments:

1. Tension test on mild steel and HYSD bars.
2. Compression test on mild steel, cast iron and wood.
3. Torsion test on mild steel circular sections
4. Bending Test on Wood Under two point loading
5. Shear Test on Mild steel- single and double shear
6. Impact test on Mild Steel (Charpy & Izod)
7. Hardness tests on ferrous and non-ferrous metals- Brinell's, Rockwell and Vicker's
8. Tests on Bricks and Tiles
9. Tests on Fine aggregates-Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking
10. Tests on Coarse aggregates-Absorption, Moisture content, specific gravity, Bulk density and Sieve analysis
11. Demonstration of Strain gauges and Strain indicators

NOTE: All tests to be carried out as per relevant latest BIS Codes

Course outcomes: After successful completion of the course, the students will be able to:

1. Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion.
2. Identify, formulate and solve engineering problems of structural elements subjected to flexure.
3. Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials.

Question paper pattern:

- Group experiments - Tension test, compression test, torsion test and

bending test.

- Individual Experiments - Remaining tests.
- Two questions are to be set - One from group experiments and the other as individual experiment.
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

Reference Books:

1. Davis, Troxell and Hawk, "Testing of Engineering Materials", International Student Edition – McGraw Hill Book Co. New Delhi.
2. M L Gambhir and Neha Jamwal, "Building and construction materials-Testing and quality control", McGraw Hill education(India)Pvt. Ltd., 2014
3. Fenner, " Mechanical Testing of Materials", George Newnes Ltd. London.
4. Holes K A, "Experimental Strength of Materials", English Universities Press Ltd. London.
5. Suryanarayana A K, "Testing of Metallic Materials", Prentice Hall of India Pvt. Ltd.New Delhi.
6. Kukreja C B, Kishore K. and Ravi Chawla "Material Testing Laboratory Manual",Standard Publishers & Distributors 1996.
7. Relevant **latest IS Codes**

TITLE OF THE COURSE: BASIC SURVEYING PRACTICE B.E., III Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CVL38**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
Total Number of Hours	**40**	**Exam Hours**	**03**
RBT Levels	**L1, L2, L3, L4**		

Credits – 02

Course Objectives: The objectives of this course is to make students to:

1. Apply the basic principles of engineering surveying and measurements
2. Follow effectively field procedures required for a professional surveyor
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.

Experiments:

1. a) Measurements of distances using tape along with horizontal planes and slopes, direct ranging.
   b) Setting out perpendiculars. Use of cross staff, optical square
2. Obstacles in chaining and ranging – Chaining but not ranging, ranging but not chaining, both ranging and chaining.
3. Measurements of bearings / directions using prismatic compass, setting of geometrical figures using prismatic compass.
4. Measurement of bearings of sides of a closed traverse and adjustment of closing error by Bowditch method.
5. Determination of distance between two inaccessible points using compass and accessories
6. Determination of reduced levels of points using dumpy level/auto level (simple leveling)
7. Determination of reduced levels of points using dumpy level/auto level (differential leveling and inverted leveling)
8. To determine the difference in elevation between two points using Reciprocal leveling and to determine the collimation error
9. To conduct profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in excel. Block contour on graph paper to scale
10. Measurement of horizontal angle by repetition and reiteration methods and Measurement of vertical angles using theodolite.
11. Determination of horizontal distance and vertical height to a base inaccessible object using theodolite by single plane and double plane method.
12. To determine distance and elevation using tachometric surveying with horizontal and inclined line of sight.
13. Closed traverse surveying using Theodolite and applying corrections for error of closure by transit rule.
14. Demonstration of Minor instruments Clinometer, Ceylon Ghat tracer, Box sextant, Hand level, Planimeter, nautical sextant and Pentagraph

Course outcomes: After a successful completion of the course, the student will be able to:

1. Apply the basic principles of engineering surveying for linear and angular measurements.
2. Comprehend effectively field procedures required for a professional surveyor.
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice.

Question paper pattern:

- All are individual experiments.
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

Reference Books:

1. B.C. Punmia, **"Surveying Vol.1"**, Laxmi Publications pvt. Ltd., New Delhi 2009.
2. Kanetkar T P and S V Kulkarni , **Surveying and Levelling Part I**, Pune VidyarthiGrihaPrakashan, 1988
3. S.K. Duggal, **"Surveying Vol.1"**, Tata McGraw Hill Publishing Co. Ltd. New Delhi.-2009.
4. K.R. Arora, **"Surveying Vol. 1"** Standard Book House, New Delhi. – 2010 & Distributors 1996.

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CIVIL ENGINEERING BOARD
BE-CBCS SYLLABUS 2017-18 Scheme

TITLE OF THE COURSE: Analysis of Determinate Structures B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV42**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: This course will enable students to

1. Apply knowledge of mathematics and engineering in calculating slope and deflections
2. Identify, formulate and solve engineering problems
3. Analyse structural systems and interpret data
4. Engage in lifelong learning with the advances in Structural Engineering

Module-1

Introduction and Analysis of Plane Trusses: Structural forms, Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and non linear analysis, Static and kinematic indeterminacies of structural systems, Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.

L2,L4,L5

Module-2

Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment-curvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple.

Moment area method: Derivation, Mohr's theorems, Sign conventions, Application of moment area method for determinate prismatic beams, Beams of varying section, Use of moment diagram by parts.

Conjugate beam method: Real beam and conjugate beam, conjugate beam theorems, Application of conjugate beam method of determinate beams of variable cross sections.

L2,L4,L5

Module-3

Energy Principles and Energy Theorems: Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, Strain energy due to axial force, bending, shear and torsion, Deflection of determinate beams and trusses using total strain energy, Deflection at the

point of application of single load, Castigliano's theorems and its application to estimate the deflections of trusses, bent frames, Special applications-Dummy unit

load method.

L2,L4,L5

Module-4

Arches and Cable Structures: Three hinged parabolic arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same and at different levels- Stiffening trusses for suspension cables.

L2, L4, L5

Module-5

Influence Lines and Moving Loads: Concepts of influence lines-ILD for reactions, SF and BM for determinate beams-ILD for axial forces in determinate trusses-Reactions, BM and SF in determinate beams using rolling loads concepts.

L2, L4, L6

Course outcomes: After studying this course, students will be able to:

1. Evaluate the forces i n determinate trusses by method of joints and sections.
2. Evaluate the deflection of cantilever, simply supported and overhanging beams by different methods
3. Understand the energy principles and energy theorems and its applications to determine the deflections of trusses and bent frames.
4. Determine the stress resultants in arches and cables.
5. Understand the concept of influence lines and construct the ILD diagram for the moving loads.

Text Books:

1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., New Delhi,2015.
3. Bhavikatti, Structual Analysis, Vikas Publishing House Pvt. Ltd, New Delhi, 2002.

Reference Books:

1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition, 2014
2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi, 2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd, 2007.

TITLE OF THE COURSE: Applied Hydraulics B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV43**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: The objectives of this course is to make students to learn:

1. Principles of dimensional analysis to design hydraulic models and Design of various models.
2. Design the open channels of various cross sections including design of economical sections.
3. Energy concepts of fluid in open channel, Energy dissipation, Water surface profiles at different conditions.
4. The working principles of the hydraulic machines for the given data and analyzing the performance of Turbines for various design data.

Module-1

Dimensional analysis: Dimensional analysis and similitude: Dimensional homogeneity, Non Dimensional parameter, Rayleigh methods and Buckingham ð theorem, dimensional analysis, choice of variables, examples on various applications.

Model analysis: Model analysis, similitude, types of similarities, force ratios, similarity laws, model classification, Reynolds model, Froude's model, Euler's Model, Webber's model, Mach model, scale effects, Distorted models. Numerical problems on Reynold's, and Froude's Model

Buoyancy and Flotation: Buoyancy, Force and Centre of Buoyancy, Metacentre and Metacentric height, Stability of submerged and floating bodies, Determination of Metacentric height, Experimental and theoretical method, Numerical problems

L1, L2, L3, L4

Module-2

Open Channel Flow Hydraulics:

Uniform Flow: Introduction, Classification of flow through channels, Chezy's and Manning's equation for flow through open channel, Most economical channel sections, Uniform flow through Open channels, Numerical Problems. Specific Energy and Specific energy curve, Critical flow and corresponding critical parameters, Metering flumes, Numerical Problems

L3,L4

Module-3

Non-Uniform Flow: Hydraulic Jump, Expressions for conjugate depths and Energy loss, Numerical Problems Gradually varied flow, Equation, Back water curve and afflux, Description of water curves or profiles, Mild, steep, critical, horizontal and adverse slope profiles, Numerical problems, Control sections

L2,L3,L4

Module-4

Hydraulic Machines:

Introduction, Impulse-Momentum equation. Direct impact of ajet on a stationary and moving curved vanes, Introduction to concept of velocity triangles, impact of jet on a series of curved vanes- Problems

Turbines – Impulse Turbines: Introduction to turbines, General lay out of a hydro-electric plant, Heads and Efficiencies, classification of turbines. Pelton wheel-components, working principle and velocity triangles. Maximum power, efficiency, working proportions – Numerical problems

L1, L2, L3,L4

Module-5

Reaction Turbines and Pumps: Radial flow reaction turbines: (i) Francis turbine-Descriptions, working proportions and design, Numerical problems. (ii) Kaplan turbine- Descriptions, working proportions and design, Numerical problems. Draft tube theory and unit quantities. (No problems)

Centrifugal pumps: Components and Working of centrifugal pumps, Types of centrifugal pumps, Work done by the impeller, Heads and Efficiencies, Minimum starting speed of centrifugal pump, Numerical problems, Multi-stage pumps.

L1,L2, L3,L4

Course outcomes:

After a successful completion of the course, the student will be able to:

1. Apply dimensional analysis to develop mathematical modeling and compute the parametric values in prototype by analyzing the corresponding model parameters
2. Design the open channels of various cross sections including economical channel sections
3. Apply Energy concepts to flow in open channel sections, Calculate Energy dissipation,
4. Compute water surface profiles at different conditions
5. Design turbines for the given data, and to know their operation characteristics under different operating conditions

Text Books:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechan ics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hy draulic Machines", Laxmi Publications, New Delhi
3. S K SOM and G Biswas, "Introduction to Fluid Mechan ics and Fluid Machines", Tata McGraw Hill,New Delhi

1. K Subramanya, "Fluid Mechanics and Hydraulic Machin es", Tata McGraw Hill Publishing Co. Ltd.
2. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press
3. C.S.P. Ojha, R. Berndtsson, and P.N. Chandramouli, *"Fluid Mechanics and Machinery"*, Oxford University Publication – 2010
4. J.B. Evett, and C. Liu, *"Fluid Mechanics and Hydraulics "*, McGraw-Hill Book Company.-2009.

TITLE OF THE COURSE: Concrete Technology B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV44**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course objectives: This course will enable students to:

1. Recognize the importance of material characteristics and their contributions to strength development in Concrete
2. Proportion ingredients of Concrete to arrive at most desirable mechanical properties of Concrete.
3. Ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures.

Module-1

Concrete Ingredients

Cement – Cement manufacturing process, steps to reduce carbon footprint, chemical composition and their importance, hydration of cement, types of cement. Testing of cement. Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregates Water – qualities of water. Chemical admixtures – plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures – Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash.

L1, L2, L3

Module-2

Fresh Concrete

Workability-factors affecting workability. Measurement of workability–slump, Compaction factor and Vee-Bee Consistometer tests, flow tests. Segregation and bleeding. Process of manufacturing of concrete- Batching, Mixing, Transporting, Placing and Compaction. Curing – Methods of curing – Water curing, membrane curing, steam curing, accelerated curing, self- curing. Good and Bad practices of making and using fresh concrete and Effect of heat of hydration during mass concreting at project sites.

L1, L2, L3

Module-3

Hardened Concrete Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept, Testing of hardened concrete, Creep –facto rs affecting creep. Shrinkage of concrete – plastic shrinking and drying shrinkage, Factors affecting shrinkage. Definition and significance of durability. Internal and external factors influencing durability, Mechanisms- Sulphate attack – chloride attack, carbonation, freezing and thawing. Corrosion, Durability requirements as per

IS-456, In situ testing of concrete- Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.

L1, L2, L3

Module-4

Concrete Mix Proportioning

Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS-10262

L1, L2, L3, L4

Module-5

Special Concretes

RMC- manufacture and requirement as per QCI-RMCPCS, properties, advantages and disadvantages. Self-Compacting concrete- concept, materials, tests, properties, application and typical mix Fiber reinforced concrete - Fibers types, properties, application of FRC. Light weight concrete-material properties and types. Typical light weight concrete mix and aplications

L1, L2, L3 L4

Course outcomes:

After studying this course, students will be able to:

1. Relate material characteristics and their influence on microstructure of concrete.
2. Distinguish concrete behaviour based on its fresh and hardened properties.
3. Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional codes.

Text Books:

1. Neville A.M. “Properties of Concrete”-4th Ed., Long man.
2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.
3. Kumar Mehta. P and Paulo J.M. Monteiro “Concrete-Mi crostructure, Property and Materials”, 4th Edition, McGraw Hill Education, 201 4
4. A.R. Santha Kumar, “Concrete Technology”, Oxford Un iversity Press, New Delhi (New Edition)

1. M L Gambir, “Concrete Technology”, McGraw Hill Educ ation, 2014.
2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9
3. Job Thomas, “Concrete Technology”, CENGAGE Learning , 2015
4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete]Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete-BMTPC
5. Specification and Guidelines for Self-Compacting Concrete, EFNARC, Association House

TITLE OF THE COURSE: Basic Geotechnical Engineering B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV45**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: This course will enable students

1. To appreciate basic concepts of soil mechanics as an integral part in the knowledge of civil engineering. Also to become familiar broadly with geotechnical engineering problems such as, foundation engineering, flow of water through soil medium and terminologies associated with geotechnical engineering.
2. To know the basic engineering properties and the mechanical behaviour of different types of soil. This includes strength-deformation characteristics under shearing stresses. Also consolidation properties of clayey soils.
3. To determine the improvement in mechanical behaviour by densification of soil deposits using compaction.
4. To know how the properties of soils that can be measured in the lab

Module-1

Introduction:

Introduction, origin and formation of soil, Phase Diagram, phase relationships, definitions and their inter relationships. Determination of Index properties-Specific gravity, water content, in-situ density and particle size analysis (sieve and sedimentation analysis) Atterberg's Limits, consistency indices, relative density, activity of clay, Plasticity chart, unified and BIS soil classification.

L1, L2

Module-2

Soil Structure and Clay Mineralogy

Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and ontmorillonite and their application in Engineering

Compaction of Soils: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control - compactive effort & method of compaction, lift thickness and number of passes, Proctor's needle, Compacting equipments and their suitability.

L1, L2

Module-3

Flow through Soils:

Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity,
superficial velocity and coefficient of percolation, Capillary Phenomena

Seepage Analysis: Laplace equation, assumptions, limitations and its derivation. Flow nets- characteristics and applications. Flow nets for sheet piles a nd below the dam section.

Unconfined flow, phreatic line (Casagrande's method –with and without toe filter), flow through dams, design of dam filters.

Effective Stress Analysis: Geostatic stresses, Effective stress concept-total stress, effective

stress and Neutral stress and impact of the effective stress in construction of structures, quick sand phenomena

L1, L2, L3

Module-4

Consolidation of Soil:

Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory - assumption and limitations. Derivation of Governing differential Equation Pre-consolidation pressure and its determination by Casagrande's method. Over consolidation ratio, normally consolidated, under

consolidated and over consolidated soils. Consolidation characteristics of soil (Cc, av, mv and Cv. Laboratory one dimensional consolidation test, characteristics of e-log(σ) curve, Determination of consolidation characteristics of soils compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method). Primary and secondary consolidation.

L1, L2, L3,

L4Module-5

Shear Strength of Soil:

Concept of shear strength, Mohr–Coulomb Failure Criterion, Modified Mohr–Coulomb Criterion

Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils. Thixotrophy and sensitivity, Measurement of shear strength parameters - Direct shear test, unconfined compression test, triaxial compression test and field Vane shear test, Test under different drainage conditions. Total and effective stress paths.

L2, L3

Course outcomes:

On the completion of this course students are expected to attain the following outcomes;

1. Will acquire an understanding of the procedures to determine index properties of any type of soil, classify the soil based on its index properties
2. Will be able to determine compaction characteristics of soil and apply that knowledge to assess field compaction procedures
3. Will be able to determine permeability property of soils and acquires conceptual knowledge about stresses due to seepage and effective stress; Also acquire ability to estimate seepage losses across hydraulic structure
4. Will be able to estimate shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory.
5. Ability to solve practical problems related to estimation of consolidation settlement of soil deposits also time required for the same.

Text Books:

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics- (2000), New Age International (P) Ltd., Newe Delhi.
2. Punmia B C, Soil Mechanics and Foundation Engineering- (2012) , Laxmi Pulications.
3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering- (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
4. Braja, M. Das, Geotechnical Engineering; (2002), Fifth Edition, Thomson

Business Information India (P) Ltd., India

Reference Books:

1. T.W. Lambe and R.V. Whitman, Soil Mechanics, John Wiley & Sons, 1969.
2. Donold P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi
3. Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering-. (2009), "Tata Mc Graw Hill.
4. Narasimha Rao A. V. & Venkatrahmaiah C, Numerical Problems, Examples and objective questions in Geotechnical Engineering-. (2000), Universities Press., Hyderabad.
5. Muni Budhu ,Soil Mechanics and Foundation Engg.- (2010), 3rd Edition, John Wiely & Sons

TITLE OF THE COURSE: Advanced Surveying B.E., IV Semester, Civil Engineering [As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV46**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: This course will enable students to:

1. Apply geometric principles to arrive at solutions to surveying problems.
2. Analyze spatial data using appropriate computational and analytical techniques.
3. Design proper types of curves for deviating type of alignments.
4. Use the concepts of advanced data capturing methods necessary for engineering practice

Module-1

Curve Surveying

Curves – Necessity – Types, Simple curves, Elements , Designation of curves, Setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankines deflection angle method (numerical problems). Compound curves, Elements, Design of compound curves, Setting out of compound curves (numerical problems). Reverse curve between two parallel straights (numerical problems on Equal radius and unequal radius). Transition curves Characteristics , numerical problems on Length of Transition curve, Vertical curves –Types – (theory).

L1,L3,L5

Module-2

Geodetic Surveying and Theory of Errors

Geodetic Surveying: Principle and Classification of triangulation system, Selection of base line and stations, Orders of triangulation, Triangulation figures, Reduction to Centre, Selection and marking of stations Theory of Errors: Introduction, types of errors, definitions, laws of accidental errors, laws of weights, theory of least squares, rules for giving weights and distribution of errors to the field observations, determination of the most probable values of quantities.

L1,L2, L3

Module-3

Introduction to Field Astronomy: Earth, celestial sphere, earth and celestial coordinate systems, spherical triangle, astronomical triangle, Napier's rule

L4,L5

Module-4
Aerial Photogrammetry Introduction, Uses, Aerial photographs, Definitions, Scale of vertical and tilted photograph (simple problems), Ground Co-ordinates (simple problems), Relief Displacements (Derivation), Ground control, Procedure of aerial survey, overlaps and mosaics, Stereoscopes, Derivation Parallax **L2,L3, L5**
Module-5
Modern Surveying Instruments Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station, Lidar scanners for topographical survey. Remote Sensing: Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation. Digital image processing, Global Positioning system Geographical Information System: Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system Geospatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering(transportation, town planning). **L2,L3, L5**
Course outcomes: After a successful completion of the course, the student will be able to: 1. Apply the knowledge of geometric principles to arrive at surveying problems 2. Use modern instruments to obtain geo-spatial data and analyse the same to appropriate engineering problems. 3. Capture geodetic data to process and perform analysis for survey problems with the use of electronic instruments; 4. Design and implement the different types of curves for deviating type of alignments.
Text Books: 1. B.C. Punmia, “Surveying Vol.2”, Laxmi Publications pvt. Ltd., New Delhi. 2. Kanetkar T P and S V Kulkarni , Surveying and Levelling Part 2, Pune Vidyarthi Griha Prakashan, 3. K.R. Arora, “Surveying Vol. 1” Standard Book House, New Delhi. 4. Sateesh Gopi, Global Positioning System, Tata McGraw Hill Publishing Co. Ltd. New Delhi **Reference Books:** 1. S.K. Duggal, “Surveying Vol.I & II”, Tata McGraw Hi ll Publishing Co. Ltd. New Delhi. 2. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi. 3. David Clerk, Plane and Geodetic Surveying Vol1 and Vol2, CBS publishers 4. B Bhatia, Remote Sensing and GIS , Oxford University Press, New Delhi. 5. T.M Lillesand,. R.W Kiefer,. and J.W Chipman, Remote sensing and Image interpretation , 5th edition, John Wiley and Sons India 6. James M Anderson and Adward M Mikhail, Surveying theory and practice, 7th Edition, Tata McGraw Hill Publication. 7. Kang-tsung Chang, Introduction to geographic information systems, McGraw Hill Higher Education

TITLE OF THE COURSE: Fluid Mechanics and Hydraulic Machines Laboratory
B.E., IV Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CVL47**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
Total Number of Hours	**40**	**Exam Hours**	**03**
RBT Levels	**L1, L2, L3, L4**		

Credits – 02

Course Objectives: This course will enable students to;

1. calibrate flow measuring devices
2. determine the force exerted by jet of water on vanes
3. measure discharge and head losses in pipes
4. understand the fluid flow pattern

Experiments:

1. Verification of Bernoulli's equation
2. Determination of Cd for Venturimeter and Orifice meter
3. Determination of hydraulic coefficients of small vertical orifice
4. Calibration of Rectangular and Triangular notch
5. Calibration of Ogee and Broad crested weir
6. Determination of Cd for Venturiflume
7. Experimental determination of force exerted by a jet on flat and curved plates (Hemispherical Vane).
8. Experimental determination of operating characteristics of Pelton turbine
9. Determination of efficiency of Francis turbine
10. Determination of efficiency of Kaplan turbine
11. Determination of efficiency of centrifugal pump
12. Determination of Major and Minor Losses in Pipes
13. Demonstration Experiments:
    a. Reynold's experiment to understand laminar and turbulent flow
    b. Flow Visualization
    c. Calibration of Sutro-weir

Course outcomes: During the course of study students will develop understanding of:

1. Properties of fluids and the use of various instruments for fluid flow measurement.
2. Working of hydraulic machines under various conditions of working and their characteristics.

- All experiments are to be included in the examination except demonstration exercises.
- Candidate to perform experiment assigned to him
- Marks are to be allotted as per the split up of marks shown on the cover page of answer script

Reference Books:

1. Sarbjit Singh , *Experiments in Fluid Mechanics* - PHI Pvt. Ltd.- New Delhi
2. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press
3. Hydraulics and Fluid Mechanics' – Dr. P.N. Modi & D r S.M. Seth, Standard Book House- New Delhi. 2009 Edition

Title of the Course: Engineering Geology Laboratory

BE–IV SEMESTER Civil Engineering [AsperChoiceBasedCreditSystem (CBCS) scheme]

Subject Code		17CVL48	CIE Marks	40
Number of Hours/Week	Lecture	03(1hrtutorial+2hr laboratory)	SEE Marks	60
Total Number of Hours	Lecture	40 hr	Exam Hours	03
RBT Levels	L1, L2, L3, L4			
CREDITS–02				

Course objectives: This course will enablestudents

1. Toidentifythemineralsandrocksbasedontheirinherentpropertiesandusesincivil engineering
2. Tointerpretthegeologicalmapsrelatedtocivilengineeringprojects.
3. Tolearnthedipandstrike,boreholeproblems,thicknessofgeologicalformationrelated tofoundation,tunnels,reservoirsandmining.
4. Tounderstand subsurfacegeologicalconditionsthroughageophysical techniquesandwatershedmanagement.
5. Tovisitthecivilengineeringprojectslikedams,reservoirs,tunnels,quarrysitesetc.

Modules	Teaching Hours	RevisedBloom's Taxonomy (RBT Level)
1. Identification of minerals as mentioned in theory, their properties, uses and manufacturing of construction materials.	6 Hours	L1, L2,L3
2. Identification of rocks as mentioned in theory, their engineering properties and uses in construction and decorative purposes	6 Hours	L1,L2, L3
3. Dip and Strike problems: Determination of dip and strike direction in Civil Engineering projects (Railway lines, tunnels, dams, reservoirs) –graphical or any other method.	6 Hours	L3,L4
4. Bore hole problems: Determination of subsurface behavior of rocks, their attitude related to foundation, tunnels, reservoirs and mining. Triangular and Square	6 Hours	L3, L4
5. Calculation of Vertical, True thickness and width of the outcrops.	3 Hours	L3,L4
6. Interpretationof Electricalresistivitycurvestofind out subsurface information such as thickness of soil, weathered zone, depth of hard rock and saturated zone	4 Hours	L3, L4
7. Interpretation of Toposheets and geological maps related to Civil Engineering Projects	9 Hours	L2,L3, L4

Course outcomes:

Duringthiscourse,studentswilldevelopexpertisein;

1. Identifying the minerals and rocks and utilize them effectively in civil engineering practices
2. Understanding and interpreting the geological conditions of the area for the implementationofcivilengineeringprojects.
3. Interpreting subsurfaceinformationsuchasthickness ofsoil,weathered zone,depthof hardrockandsaturatedzone byusinggeophysicalmethods.
4. Thetechniquesofdrawingthecurvesofelectricalresistivitydataanditsinterpretationfor geotechnicalandaquiferboundaries

ProgramObjectives(asperNBA):

- oEngineeringKnowledge.
- oProblemAnalysis.
- oDesign/developmentofsolutions(partly).
- oInterpretationofdata.

Questionpaperpattern:**Questionpaper should be set for 100 marks**

Allareindividualexperiments

Instructions asprinted onthecoverpageofanswer scriptfor splitupofmarkstobe strictlyfollowed.

Allexercisesaretobeincludedfor practicalexamination.

Question PaperPattern		
Qn.No.	EXPERIMENT	MARKS(100)
1	IdentificationofMinerals bygivingtheirphysical propertiesandcivilengineeringapplications(5 minerals)	25(5 x5)
2	Identificationofrocksbygivingtheirphysical properties,classificationandtheircivil engineeringapplications(5rocks)	25(5 x5)
3	Dipandstrikeproblems	7
4	Boreholeproblems(3pointmethod)	12
5	Thicknessofstrataproblemsincludingcalculation ofvertical,truethicknessanditswidthofout crop.	5
6	Electricalresistivitycurvesdrawingandits interpretationforGeotechnicalandAquifer investigations.	7
7	InterpretationofToposheets	6
8	Geologicalmaps,theircrosssectionsand description	15
9	Vivavoce	5

Note:

1)Questionnos.1,2,4,5.7,8&9arecompulsory.

2)**Amongquestionno. 3&6anyone shallbegiven**.

3)InternalAssessmentMarks=**40**:Byconducingatleastonetestfor**20marks**remaining

a)**10 marksforrecord**andb)**10 marks forfield visit report submission**(Engineering projects)

ReferenceBooks:

1. MPBillings,StructuralGeology,CBSPublishersandDistributors,NewDelhi
2. B.S.SatyanarayanaSwamy, Engineering Geology Laboratory Manual , DhanpatRai Sons,NewDelhi.
3. LRANarayan,Remotesensinganditsapplications,UniversityPress.
4. P.K.MUKERJEE,TextbookofGeology,WorldPressPvt.Ltd.,Kolkatta
5. JohnIPlattandJohnChallinor,SimpleGeologicalStructures,ThomasMurthy&Co,London