B. Tech 3rdSem Civil Engineering **Contact Hours: 24**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-18301	Engineering Mechanics	3	1	0	40	60	100	4
BTCE-18302	Introduction to Fluid Mechanics	3	1	0	40	60	100	4
BTCE-18303	Introduction to Civil Engineering	3	0	0	40	60	100	3
BTCE-18304	Building Materials and Construction	3	0	0	40	60	100	3
BTCE-18305	Engineering Geology	3	0	0	40	60	100	3
BTCE-18306	Surveying and Geomatics	4	1	0	40	60	100	5
BTCE-18307	Surveying and Geomatics Lab	0	0	2	30	20	50	1
BTCE-18308	Summer internship institutional training*				60	40	100	1
		19	**03**	**02**	**330**	**420**	**750**	**24**

***The marks will be awarded on the basis of 04 weeks Institutional Practical Training conducted after 2ndSemester**

B. Tech 4th Semester Civil Engineering **Contact Hours: 23**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-18401	Solid Mechanics	3	1	0	40	60	100	4
BTCE-18402	Hydraulic Engineering	4	1	0	40	60	100	5
BTCE-18403	Energy Science and Engineering	3	0	0	40	60	100	3
BTCE-18404	Numerical Methods in Civil Engineering	3	1	0	40	60	100	4
BTCE-18405	Construction Machinery and Works Management	3	0	0	40	60	100	3
BTCE-18406	Solid Mechanics Lab	0	0	2	30	20	50	1
BTCE-18407	Hydraulic Engineering Lab	0	0	2	30	20	50	1
CEMC-I#	Management –I (Organizational Behaviour)	0	0	0	-	-	-	0
		16	**03**	**4**	**260**	**340**	**600**	**21**

#Students will give presentations on the subject

B. Tech 5th Sem Civil Engineering **Contact Hours: 23**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-18501	Civil Engineering Societal and Global Impact	2	0	0	40	60	100	2
BTCE-18502	Irrigation Engineering-I	3	0	0	40	60	100	3
BTCE-18503	Structural Analysis-I	3	1	0	40	60	100	4
BTCE-18504	Environmental Engineering	3	0	0	40	60	100	3
BTCE-18505	Design of Concrete Structure-I	3	1	0	40	60	100	4
BTCE-18506	Hydrology & Water Resources Engineering	3	0	0	40	60	100	3
BTCE-18507	Concrete Technology Lab	0	0	2	30	20	50	1
BTCE-18508	Structural Engineering Lab	0	0	2	30	20	50	1
BTCE-18509	Project-I (Survey Camp)	-	-	-	60	40	100	1
CEMC–II#	Constitution of India/ Essence of Indian Traditional Knowledge	-	-	-	-	-	-	-
		17	**02**	**04**	**360**	**440**	**800**	**22**

#Students will give presentations on the subject

***The marks will be awarded on the basis of 04 weeks Survey Camp conducted after 4th Semester**

B. Tech 6th Sem Civil Engineering **Contact Hours: 26**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-18601	Geotechnical Engineering	3	1	0	40	60	100	4
BTCE-18XXX	Departmental Elective-I	3	1	0	40	60	100	4
BTCE-18XXX	Departmental Elective-II	3	1	0	40	60	100	4
BTCE-18XXX	Departmental Elective-III	3	0	0	40	60	100	3
BTCE-18XXX	Departmental Elective-IV	3	1	0	40	60	100	4
BTXX-18XXX	Open Elective-I (Humanities)	3	0	0	40	60	100	3
BTCE-18602	Computer-aided Civil Engineering Drawing	0	0	2	30	20	50	1
BTCE-18603	Geotechnical Engineering Lab	0	0	2	30	20	50	1
		18	**04**	**04**	**300**	**400**	**700**	**24**

B. Tech 7th Sem Civil Engineering **Contact Hours: 21**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-18XXX	Departmental Elective V	3	1	0	40	60	100	4
BTCE-18XXX	Departmental Elective-VI	3	0	0	40	60	100	3
BTXX-18XXX	Open Elective-II	3	0	0	40	60	100	3
BTCE-18701	Transportation Engineering	3	0	0	30	20	50	3
BTCE-18702	Transportation Engineering Lab	0	0	2	30	20	50	1
BTCE-18703	Computer-aided Civil Engineering Design	0	0	2	30	20	50	1
BTCE-18704	Project- (Minor Project)	0	0	4	50	50	100	2
BTCE-18705	Summer internship*	-	-	-	60	40	100	1
		12	**01**	**08**	**320**	**330**	**650**	**18**

***The marks will be awarded on the basis of 06 weeks Industrial / Institutional Training conducted after 6th Semester**

B. Tech 8th Sem Civil Engineering **Contact Hours: 18**

Course Code	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits
		L	T	P	Internal	External		
BTCE-18XXX	Departmental Elective VII	3	0	0	40	60	100	3
BTCE-18XXX	Departmental Elective VIII	3	0	0	40	60	100	3
BTXX-18XXX	Open Elective-III	3	0	0	40	60	100	3
BTCE-18801	Professional Practice	3	0	0	40	60	100	3
BTCE-18802	Project- (Major Project)	0	0	06	100	50	150	3
		12	**00**	**06**	**260**	**290**	**550**	**15**

Departmental Elective I	Departmental Elective II
BTCE-18901 Structural Analysis-II	BTCE-18905 Design of Concrete Structures-II
BTCE-18902 Advanced Structural Analysis	BTCE-18906 Concrete Technology
BTCE-18903 Design of Structural Systems	BTCE-18907 Reinforced Concrete

Departmental Elective III	Departmental Elective IV
BTCE-18910 Physio-Chemical Processes For Water and Waste Water Treatment	BTCE-18915 Irrigation Engineering II
BTCE-18911 Ecological Engineering	BTCE-18916 Water Quality Engineering
BTCE-18912 Environmental Systems	BTCE-18917 Environmental Fluid Mechanics

Departmental Elective V	Departmental Elective VI
BTCE-18920 Design of Steel Structure	BTCE-18923 Foundation Engineering
BTCE-18921 Structural Dynamics	BTCE-18924 Bridge Engineering
BTCE-18922 Metal Structure Behaviour	BTCE-18925 Offshore Engineering

Departmental Elective VII	Departmental Elective VIII
BTCE-18930 Railway Engineering	BTCE-18935 Element of Earth Quake Engineering
BTCE-18931 Port and Harbour Engineering	BTCE-18936 Disaster Management
BTCE-18932 Traffic Engineering and Management	BTCE-18937 Geographic Information Systems and Sciences

Open Elective II	Open Elective III
BTCE-18951 Metro Systems and Engineering	BTCE-18955 Urban Hydrology and Hydraulics
BTCE-18952 Public Transportation Systems	BTCE-18956 Water Quality Engineering
BTCE-18953 Intelligent Transportation Systems	BTCE-18957 Water Resources Field Methods

BTCE-18301 Engineering Mechanics

L T P
3 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: The objective of this Course is to provide an introductory treatment of Engineering Mechanics to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters.

1. Introduction to Engineering Mechanics Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy. **(4)**

2. Friction Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack. **(3)**

3. Basic Structural Analysis Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines; **(3)**

4. Centroid and Centre of Gravity Centroid of simple figures from first Principle, centroid of composite sections; Centre of Gravity and its implications; Area Moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite Sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. **(5)**

5. Virtual Work and Energy Method- Virtual displacements, principle of virtual Work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, Systems with friction, mechanical efficiency. Conservative forces and potential energy (Elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium. **(5)**

6. Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (Rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained Motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, Power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique). **(5)**

7. Introduction to Kinetics of Rigid Bodies Basic terms, general principles In dynamics; Types of motion, Instantaneous Centre of rotation in plane motion and simple Problems; D Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of Rigid body rotation. **(5)**

Course Outcomes:

1. Use scalar and vector analytical techniques for analysing forces in statically determinate structures.
2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
3. Apply basic knowledge of maths and physics to solve real-world problems
4. Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
5. Understand basic dynamics concepts – force, momentum, work and energy;
6. Understand and be able to apply Newton's laws of motion;
7. Understand and be able to apply other basic dynamics concepts - the Work-Energy
8. Principle, Impulse-Momentum principle and the coefficient of restitution

Text/Reference Books:

1. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
2. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
3. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics
4. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
5. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
6. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

BTCE-18302 Introduction to Fluid Mechanics

L T P
3 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: This course is to introduce the concepts of fluid mechanics useful in Civil Engineering applications. The course provides a first level exposure to the students to fluid Statics, kinematics and dynamics. Measurement of pressure, computations of hydrostatic Forces on structural components and the concepts of Buoyancy all find useful applications in many engineering problems.

1. Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **(5)**

2. Fluid Statics - Fluid Pressure: Pressure at a point, Pascal's law, and pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies. **(8)**

3. Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates **(8)**

4. Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number. **(9)**

Course Outcomes:

1. Understand the broad principles of fluid statics, kinematics and dynamics
2. Understand definitions of the basic terms used in fluid mechanics
3. Understand classifications of fluid flow
4. Be able to apply the continuity, momentum and energy principles
5. Be able to apply dimensional analysis

Text/Reference Books:

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli,

Oxford University Press, 2010

2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Fluid Mechanics & Hydraulic Machines : Dr. R.K. Bansal
4. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
5. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

BTCE-18303 Introduction to Civil Engineering

L T P
3 0 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering. To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness. To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

1. Basic Understanding: What are Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career. **(2)**

2. History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers **(2)**

3. Overview of National Planning for Construction and Infrastructure Development; Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works; **(1)**

4. Fundamentals of Architecture & Town Planning: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities. **(2)**

5. Fundamentals of Building Materials: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes. **(2)**

6. Basics of Construction Management & Contracts Management: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Advent of Lean Construction; Importance of Contracts Management **(3)**

7. Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction; **(2)**

8. Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunneling. **(3)**

9. Hydraulics, Hydrology &Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multipurpose reservoir projects**.** **(3)**

12. Structural Engineering: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies. **(3)**

13. Surveying & Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR; **(3)**

14. Traffic &Transportation Engineering: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and Freight Transportation; Road Safety under heterogeneous traffic; Sustainable and resilient pavement materials, design, construction and management; Case studies and examples. **(3)**

Course Outcomes:

1. Introduction to what constitutes Civil Engineering
2. Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering.
3. Exploration of the various possibilities of a career in this field
4. Providing inspiration for doing creative and innovative work
5. Infrastructure, and impressive projects to serve as sources of inspiration
6. Highlighting possibilities for taking up entrepreneurial activities in this field
7. Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering

Text/Reference Books:

1. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
2. The National Building Code, BIS, (2017)
3. RERA Act, (2017)
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration

BTCE-18304 Building Materials and Construction

L T P
3 0 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: To give an understanding to the students of the vast breadth and numerous available building materials used for different types of constructions and their characterization.

1. Building Stones & Bricks: Characteristics of a good building stone, Deterioration and preservation of stones, Artificial stones, Composition of good brick earth, Qualities of good bricks, Classification of bricks, Tests on bricks, Varieties of fire bricks. **(3)**

2. Cement: Types, uses and composition of cement, raw materials, manufacturing process, varieties and properties of cement, hydration of cement, testing of cement. **(2)**

3. Concrete: Introduction, constituents of concrete, batching of materials, manufacturing process of cement concrete, workability and factors affecting it, use of different waste materials in concrete, methods to determine workability, segregation and bleeding of concrete, strength of concrete and factors affecting it. **(4)**

4. Timber: Structure of a tree, classification of trees, qualities of good timber, defects in timber, seasoning of timber, decay of timber, preservation of timber. **(3)**

5. Foundation and Walls: Definition, types of foundation, causes of failures of foundation and remedial measures, types of wall and thickness considerations. **(3)**

6. Brick and Stone Masonry: Types of bond & their merits and demerits. Rubble and ashlar joints in stone masonry. Cement concrete hollow blocks and their advantages and disadvantage. **(3)**

7. Damp Proofing: Causes of dampness, preventive measures for dampness in buildings. **(2)**

8. Roofs: Classification of roofs and roof trusses, members of roof trusses different roof covering materials. **(2)**

9. Plastering and Pointing: Advantages of plastering and pointing, methods of plastering, materials and types, defects in plastering, different types of finishing plastered surface. **(3)**

10. Floors: Types of floors used in building & and their suitability, factors for selecting suitable floor for building. **(3)**

11. Miscellaneous Topics: Paints, Bitumen, Glass, Building services – Plumbing, Electrical, Air conditioning, Acoustics & sound insulation, Fire protection measures**.** **(3)**

Course Outcomes:

After completing this course, the student must demonstrate the knowledge and ability to:

1. Identify and characterize building materials
2. Understand the manufacturing process of bricks, cement and concrete.
3. Select the appropriate methods for preservation of timber and metals.
4. Evaluate the quality of building material through visual inspection or by laboratory testing.
5. Apply the knowledge to select suitable construction techniques for different building components.
6. Use the suitable techniques of damp proofing and fire resistance.

Text/Reference Books:

1. Rangwala – Building materials.
2. Bindra SP, Arora KR Building construction.
3. Shetty MS, Concrete Technology.
4. Punmia BC, Building construction.
5. Singh, Parbin, Building materials.
6. Sushil Kumar, Building Construction.

BTCE-18305 Engineering Geology

L T P
3 0 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: This Course is to focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Through lectures, labs, and case study examination student will learn to couple geologic expertise with the engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects and the quantification of processes such as rock slides, soil-slope stability, settlement, and liquefaction.

1: Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. **(1)**

2: Petrology-Rock forming processes. Specific gravity of rocks. Ternary diagram. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Concept of Hot spring and Geysers. Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their characteristics. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. IUGS Classification of phaneritic and volcanic rock.. Field Classification chart. Structures. Classification of Igneous rocks on the basis of Chemical composition. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures & textures in metamorphic rocks. Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation. **(6)**

3: Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints, Solifluction deposits, mudflows, Coastal deposits**.** **(4)**

4: Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures. **(5)**

5: Geological Hazards- Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. . Types of landslide. Prevention by surface drainage, slope reinforcement by Rock

bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay. Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water. **(3)**

6: Rock masses as construction material: Definition of Rock masses. Main features constituting rock mass. Main features that affects the quality of rock engineering and design.Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Core logging Rock Quality Designation. Rock mass description. **(4)**

7: Geology of dam and reservoir site- Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures. **(4)**

8: Rock Mechanics- Sub surface investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation of rocks, Failure theories and sheer strength of rocks, bearing capacity of rocks. **(3)**

Course Outcomes:

1. Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice
2. The fundamentals of the engineering properties of Earth materials and fluids.
3. Rock mass characterization and the mechanics of planar rockslides and topples.
4. Soil characterization and the Unified Soil Classification System.
5. The mechanics of soils and fluids and their influence on settlement, liquefaction, and soil slope stability.

Text/Reference Books:

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
2. Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3. Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

BTCE-18306 Surveying and Geomatics

L T P
4 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives:
With the successful completion of the course, the student should have the capability to:
a) Describe the function of surveying in civil engineering construction,
b) Work with survey observations, and perform calculations,
c) Customary units of measure. Identify the sources of measurement errors and mistakes; understand the difference between accuracy and precision as it relates to distance, differential levelling, and angular measurements.
d) Be familiar with the principals of recording accurate, orderly, complete, and logical field notes from surveying operations, whether recorded manually or with automatic data collection methods.

1: Introduction to Surveying : Principles of surveying, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal levelling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; Contouring Characteristics, methods and uses; areas and volumes. **(8)**

2: Theodolite Surveying: Introduction to triangulation**,** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods - triangulation - network- Signals. Baseline - choices - instruments and accessories - extension of base lines - corrections - Satellite station - reduction to centre - Intervisibility of height and distances - Trigonometric levelling. **(7)**

3: Curves Elements of simple and compound curves – Introduction of different types of curves, elements of curves, Method of setting out–Reverse curve, Transition curve, circular curve and vertical curves. **(7)**

4: **Modern Field Survey System:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations. **(6)**

5: Photogrammetry Surveying : Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes. **(7)**

6: **Remote Sensing:** Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing. **(5)**

Course Outcomes:

1. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities
2. Translate the knowledge gained for the implementation of Civil infrastructure facilities
3. Relate the knowledge on Surveying to the new frontiers of science like Hydrographic surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing.

Text/Reference Books:

1 Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
2 Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
3 Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
4 Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
5 Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.

BTCE-18307 Surveying and Geomatics Lab

L T P
0 0 2

Internal Marks: 40
External Marks: 60
Total Marks: 100

List of Experiments:

1. Measurement of distance, ranging a line.
2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
3. Different methods of leveling, height of instrument, rise & fall methods.
4. Measurement of horizontal and vertical angle by theodolite.
5. Determination of tachometric constants and determination of reduced levels by tachometric observations.
6. Plane table survey, different methods of plotting, two point & three point problem.
7. Determination of height of an inaccessible object.
8. Setting out a transition curve. Setting out of circular curves in the field using different methods.
9. Preapartion of Map using above methods and Total station.

BTCE-18308 Institutional (Workshop) Training

Institutional Training (Carpentry shop, Welding Shop, Fitting shop, Electrical Shop and Auto CAD Lab) will be imparted in the Institution at the end of 2nd semester for four (04) weeks duration (36 hours per week). Site visit will also form part of this training.

BTCE-18401 Solid Mechanics

L T P
3 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: This Course is to introduce to continuum mechanics and material modelling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design. The overarching theme is a unified mechanistic language using thermodynamics, which allows understanding, modelling and design of a large range of engineering materials.

1: Simple Stresses and Strains- Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law– stress strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications. **(4)**

2: Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain.Relationship between elastic constants. **(3)**

3: Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments. **(5)**

4: **Flexural Stresses-**Theory of simple bending – Assumptions – Derivation ofbending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses –Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections. **(4)**

5: Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections. **(3)**

6: Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method.Use of these methods to calculate slope and deflection for determinant beams. **(4)**

7: Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular

shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs. **(5)**

8: Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures. **(3)**

Course Outcomes:

1. Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, relative to the strength and stability of structures and mechanical components;
2. Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures; analyze solid mechanics problems using classical methods and energy methods;
3. Analyse various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress; locate the shear center of thin wall beams; and Calculate the deflection at any point on a beam subjected to a combination of loads; solve for stresses and deflections of beams under unsymmetrical loading;
4. Apply various failure criteria for general stress states at points; solve torsion problems in bars and thin walled members.

Text/Reference Books:

1. D.S. Bedi, Strength of Materials, Khanna Book Publishing Company.
2. E.P. Popov, Mechanics of Materials-(SI Version), Prentice Hall India.
3. R.S Lehri and A.S. Lehri, Strength of Materials, Kataria and Sons.
4. S.S.Rattan, Strength of Materials, Tata McGraw Hill.
5. Timoshenko and Young, Elements of Strength of Materials, East West Press (EWP).
6. James M Gere and Barry J. Goodno, Strength of Materials, Cengage Learning.
7. James M Gere, Mechanics of Materials, Thomson Brooks/Cole/Pearson, 2006.
8. R.C. Hibbeler, Mechanics of Materials, 6^{th} Edition, Pearson Education, 2007.

BTCE-18402 Hydraulic Engineering

L T P
4 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

1:Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. **(3)**

2:Turbulent Flow- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram. **(4)**

3:**Boundary Layer Analysis**-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. **(3)**

4:Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity, Rayleigh method, Buckingham's Pi method and other methods. Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problem. **(4)**

5: Introduction to Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section**.** **(3)**

6:Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient, Most economical section of channel. Computation of Uniform flow, Normal depth. **(4)**

7 :Non-Uniform Flow- Specific energy, Specific energy curve, critical flow, discharge curve Specific force, and Critical depth. Channel Transitions. Measurement of Discharge and Velocity – Venturi Flume, Standing Wave Flume, Parshall Flume, Broad Crested Weir. Measurement of Velocity- Current meter, Floats, Hot-wire anemometer. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. **(9)**

8:Hydraulic Jump- Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges. Dynamics of Fluid Flow- Momentum principle, applications: Force on plates, pipe bends, moments of momentum equation. **(5)**

9: Flow through Pipes: Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three-reservoir problem. **(5)**

Course Outcomes:

1. Apply their knowledge of fluid mechanics in addressing problems in open channels.
2. Will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
3. Will have knowledge in hydraulic machineries (pumps and turbines).

Text/Reference Books:

1. Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House
2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
3. Open channel Flow, K. Subramanya, Tata McGraw Hill.
4. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill.
5. Burnside, C.D., "*Electromagnetic Distance Measurement*," Beekman Publishers, 1971.

BTCE-18403 Energy Sciences and Engineering

L T P
3 0 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: This Course is to introduce energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.

1: Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment. **(5)**

2: Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries). **(7)**

3: Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy. (6)

4: Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems**.** **(7)**

5: **Engineering for Energy conservation:** Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption. **(7)**

Course Outcomes:

1. List and generally explain the main sources of energy and their primary applications nationally and internationally
2. Have basic understanding of the energy sources and scientific concepts/principles behind them.
   Understand effect of using these sources on the environment and climate
3. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
4. List and describe the primary renewable energy resources and technologies.
5. To quantify energy demands and make comparisons among energy uses, resources, and technologies.
6. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.
7. Understand the Engineering involved in projects utilising these sources.

Text/Reference Books:

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
5. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
6. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
7. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company
8. Related papers published in international journals

BTCE-18404 Numerical Methods in Civil Engineering

L T P
3 1 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives: After completing this course the student must demonstrate the knowledge and ability to: 1. Demonstrate the concept of approximations and errors in the implementation and development of numerical methods. 2. Select an appropriate solution to an engineering problems dealing with the roots of equations through numerical methods. 3. Execute the solution using of problems involving linear algebraic equations and appreciate the application of these problems in fields of engineering.

1: Numerical Methods – 1 Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. **(15)**

2: Numerical Methods – 2 Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge- Kutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two-dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation. **(15)**

Course Outcomes:

1. Apply the techniques to fit curves to data and be capable of choosing the preferred method for any particular problem.
2. Evaluate the solution of the problems through the numerical integration and differentiation and solve ordinary and partial differential equations and Eigen value problems through various techniques.
3. Able to use various Numeric Method for civil engineering problems.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,

2006.

4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

BTCE-18405 Construction Machinery and Works Management

L T P
3 0 0

Internal Marks: 40
External Marks: 60
Total Marks: 100

Course Objectives:

With the successful completion of the course, the student should have the capability to Understand the concept, and need of project planning and the related concepts, Utilize various management tools and techniques, such as PERT, CPM, etc. in the project planning.

1. Introduction: Need for project planning & management, time, activity & event, bar chart, Milestone chart, uses & drawbacks. **(4)**

2.PERT: Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project, numerical problems, probability of achieving scheduled project. **(10)**

3. CPM: Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control, numerical problems. **(6)**

4. Cost Analysis and Contract: Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, numerical problems, updating a project, when to update, time grid diagram, resource scheduling, planning of different components of civil engineering projects such as a house, workshop, dam, tunnel. **(8)**

5. Construction Equipment and Machinery: Dragline, Hoes. Line diagram of each, sizes, output, uses, factors affecting selection of each equipment, economic life of equipment, maintenance and repair cost, Hoisting &Transporting Equipments- Hoists, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons, Construction Equipments, concrete pumps, Working flow diagram of RMC Plant, Bituminous Plant , Paver Plant. **(6)**

6. Software: Introduction of relevant software. **(2)**

Course Outcomes:

1. Develop a network and perform time estimates to find the critical path.
2. Assess the minimum total cost and do the project scheduling.

3. Perform cost analysis for a given activity and formulate a project contract.
4. Select appropriate construction equipment and machinery for a given construction activity.

Suggested Books:

1. Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi
2. PERT and CPM - L.S.Srinath, East West Press
3. Management Guide to PERT & CPM - Wiest & levy; Prentice Hall
4. Construction Equipment & Planning and Application. - Mahesh Verma Artec Publication.
5. Construction Planning and Management by U. K. Shrivastava; Galgotia Publications Pvt. Ltd.

BTCE-18406 Solid Mechanics Lab

L T P
0 0 2

Internal Marks: 40
External Marks: 60
Total Marks: 100

List of Experiments:

1. To draw Stress Strain curve for Ductile and Brittle material in tension.
2. To draw Stress Strain curve for Ductile and Brittle material in compression.
3. To draw shear stress, shear strain curve for ductile and brittle material in torsion strength testing
4. To draw load deflection curve for spring in loading and unloading conditions.
5. To determine the hardness of the given material by Rockwell and Brinell hardness testing machine.
6. To determine the fatigue strength of the material.
7. To determine the impact strength by Izod and Charpy test.
8. To determine the load carrying capacity of the leaf spring.
9. To test a mild steel and cast iron specimen in double shear.

BTCE-18407 Hydraulic Engineering Lab

L T P
0 0 2

Internal Marks: 40
External Marks: 60
Total Marks: 100

List of Experiments:

1. To determine the meta-centric height of a floating vessel under loaded and unloaded conditions.
2. To study the flow through a variable area duct and verify Bernoulli's energy equation.
3. To determine the coefficient of discharge for an obstruction flow meter (venturimeter/orifice meter).
4. To determine the discharge coefficient for a Vee notch or rectangular notch.
5. To determine the coefficient of discharge for Broad crested weir.
6. To determine the hydraulic coefficients for flow through an orifice.
7. To determine the friction coefficient for pipes of different diameter.
8. To determine the head loss in a pipe line due to sudden expansion / sudden contraction/ bend.
9. To determine the velocity distribution for pipeline flow with a pitot static probe.