STRENGTH OF MATERIALS

Course Code	**: 20CV3GCSOM**	**Credits**	**: 4**
L:P:T:S	**: 4:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 50**

Course objective:

1. To learn about the behavior of deformable bodies, concept of stress, principal stress, strain for axially loaded beams and columns
2. To understand the theory of torsion and stresses in springs

Course Outcomes at the end of the course the students will be able to:

	Course Outcome
CO 1	Determine the stresses and strains in the members subjected to axial, bending and torsional loads
CO 2	Draw shear force and bending moment diagrams for beams subjected to different loading for statically determinate beams.
CO 3	Analyze the bending and shear stress distribution for statically determinate beams subjected to different loading
CO 4	Analyse the torsion in the circular solid and hallow shaft.
CO 5	Determine the deflection, spring stiffness and shear on closed and open coiled helical springs, leaf spring
CO 6	Analyse the behaviour of buckling of columns. Determine the principal stresses and strains in structural members

Mapping of Course outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	3	2	2									
CO 2	3	2										
CO 3	3	2	1	2								
CO 4	3	2		2								
CO 5	3	2	1									
CO 6	3	1	1									

Module	Content	Hours	CO's
1	SIMPLE STRESSES AND STRAINS: Introduction, Properties of Materials, Stress, Strain, Hook's law, Poisson's Ratio, Stress – Strain Diagram for structural steel and non ferrous materials, Principles of superposition, total elongation of circular and rectangular cross sections bars,. Elongation due to self – weight. Composite sections, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants.	**10**	**CO1 CO2**
2	BENDING MOMENT AND SHEAR FORCE IN BEAMS: Introduction, Types of beams loadings and supports, Shearing force in beam, Bending moment, Sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, SFD and BMD with salient values for cantilever beams, simply supported beams considering point loads, UDL, UVL and Couple.	**10**	**CO1 CO2**
3	STRESSES IN BEAMS: Introduction – Bending stress in beam, Assumptions in simple bending theory, Pure bending derivation of Bernoulli's equation, Modulus of rupture, section modulus, Flexural rigidity, Expression for horizontal shear stress in beam, Shear stress diagram for rectangular, symmetrical 'I' and 'T' section, Flitched beams	**10**	**CO1 CO3**
4	TORSION OF CIRCULAR SHAFTS: Introduction – Pure torsion-torsion equation of circular shafts, Strength and stiffness, Torsional rigidity and polar modulus, Power transmitted by shaft of solid and hollow circular sections. SPRINGS - Closed and open coiled helical springs, leaf spring – Concepts and simple numerical	**10**	**CO4**
5	COLUMNS AND STRUTS: Introduction – Short and long columns, Euler's theory on columns, Effective length slenderness ration, radius of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different end conditions, Limitations of Euler's theory. IS code formula as per IS 800 their significance. TRANSFORMATION STRESSES-Stress components on inclined planes subjected to 2-D dimensional stress system accompanied with shear stress. Principal stresses and principal planes at a point in a beam section. Mohr's circle of stress - Stress components on inclined planes subjected to 2-D dimensional stress system accompanied with shear stress.	**10**	**CO5** **CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

3. Assignment Questions should be from self-study component only.

Self Study Component		
Module	Contents of the unit	CO's
1	SIMPLE STRESS AND STRAIN: Total elongation of tapering bars, thermal stresses: including thermal stresses in compound bar	CO1
2	COMPOUND STRESSES: Mohr's circle of stress and strain	CO2
3	BENDING MOMENT AND SHEAR FORCE IN BEAMS: Special problems	CO3
4	BENDING STRESS, SHEAR STRESS IN BEAMS: Practical applications	CO4
5	ELASTIC : STABILITY Secant formula, Rankine's formula and problems	CO6

Text Books:

1. Elements of Strength of Materials, Timoshenko and Young, Affiliated East-West Press,1968
2. Strength of Materials, Singer, F.L. 4th edition, Harper and Row Publications.
3. Strength of Materials, R.Subramanyam, Oxford University Press, Edition 2008

References:

1. Strength materials, 3rd edition, S.Timoshenko, Vol 1. Theory and applications, CBS Publishers, Bangalore, 2004.
2. Mechanics of materials, J.M. Gere & S.P. Timoshenko, 2rd Ed., CBS Publishers
3. Mechanics of Materials, James M. Gere (5th Edition), Thomson Learning
4. Mechanics of Materials, E.P. Popov, S. Nagaraju, Z.A. Lu, Prentice Hall Publications, 1991.

SURVEYING

Course Code : 20CV3GCSUR | **Credits : 3**
L:T:P:C : 3:0:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 03 | **Total hours : 40**

Course Objectives:

1. To analyse the surveying and levelling theory for planning civil engineering projects.
2. To understand surveying instruments, their construction, calibration and use.
3. To find errors, their distribution and adjustment of instruments

Course Outcomes at the end of the course the students will be able to:

	Course Outcome
CO 1	Discuss the importance of requirements of Surveying, types of Surveying, basic principles of Surveying, selection of suitable site for survey.
CO 2	Develop the bearings of the regular geometrical shapes
CO 3	Determine the Local attraction, determination and corrections.
CO 4	Develop the ground Profile using Leveling.
CO 5	Explain the Orientation and methods of orientation.
CO 6	Measurement of horizontal angles – Method of repetitions and re-iterations.

Mapping of Course outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	3	2									
CO 2	2	3	1									
CO 3	3	3	2	2								
CO 4	3	1	1	2								
CO 5	3	2	3									
CO 6	3	1										

Module	Content	Hours	CO's
1	INTRODUCTION*:* Definition of Surveying, classification of surveying, uses of Surveying Units of Measurements, topographical Maps and their numbering, Basic principles of surveying, bench mark, Errors, Classification MEASUREMENT OF HORIZONTAL DISTANCES: Classification of chains & tapes, Ranging of lines Direct and Indirect, Measurement of distances over sloping grounds, Chain and Tape corrections - Numerical problems. CHAIN SURVEYING*:* Selection of stations and lines, Offsets and types setting out of right angles, use of optical square, prism square, cross staff, linear methods of setting out right angles, conventional symbols, Obstacles in chain survey, Numerical problems, Errors in chain survey and precautions to be taken.	**8**	**CO1**
2	MEASUREMENT OF DIRECTIONS & ANGLES: Angle, meridians, bearings, instrument- prismatic compass their parts (survey compass briefing only) temporary adjustment of prismatic compass, calculation of angles from bearings and bearings from angles, problems, local attraction, magnetic declination and related problems. THEODOLITE- Parts, temporary adjustments, fundamental axes, measurement of horizontal angles – repetition & reiteration method, measurement of vertical angles other uses of theodolite	**8**	**CO2**
3	LEVELLING: Principles and basic definitions, Fundamental axes and part of a dumpy level, Types of adjustments and objectives, Temporary adjustments of a dumpy level, Curvature and refraction correction, Type of leveling. Fly back leveling, Errors and precautions. CONTOURING: Contours and their characteristics, Methods of contouring, direct and indirect methods, Interpolation techniques, Uses of contours, Numerical problems on determining inter visibility.	**8**	**CO3**
4	CURVE SURVEYING: Definitions & notations, elements of simple curve, setting out of simple curve-by ordinates from long chord, by Rankine method of deflection angles & simple analytical problems, Compound curve- Elements of compound curve, setting out of compound curve & simple problems. Reverse curves- Elements of a reverse curve, relationship between various parts of a reverse curve (analytical problem on parallel straights only) Transition curves- General requirements, length of transition curve, characteristics of transition curve, computing & setting out.	**8**	**CO4**
5	TOTAL STATION SURVEY	**8**	**CO5**

	Concept of latitude & departure, calculation of lat- long of a closed traverse (simple analytical problem) dependent & independent coordinates, closing error balancing of a traverse by Bowditch's method & transit method (no analytical problems) adjustments GPS: Concepts, definitions, segments of GPS, equipment, methods, differential GPS, errors, applications. Introduction to LIDAR survey and hydrographic survey		

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	Contents	CO's
1	INTRODUCTION: EDM devices, Booking of chain survey work	CO1
2	Chain Survey: Bowditch's rule and transit rule	CO2
3	Contour: Grade contours and uses.	CO3
4	Plane table survey: Errors in plane table survey.	CO4
5	Theodolite: Two peg test and spire test	CO5

Text Books

1. Surveying and leveling, T P Kanetkar, Pune Vidyarthi Griha Prakashan
2. Surveying and Leveling – R Subramanian. Oxford University Press (2007)
3. Fundamentals of Surveying - Milton O. Schimidt – Wong, Thomson Learning..

References

1. Plane and Geodetic Surveying by David Clark Vol I and II, CBS Publishers.
2. 'Plane Surveying' A. M. Chandra – New age international (P) Ltd
3. 'Higher Surveying' A.M. Chandra New age international (P) Ltd
4. Fundamentals of Surveying - S.K. Roy – Prentice Hall of India
5. Surveying Vol. I, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi.
6. Text Book of Surveying – C. Venkataramiah. Universities Press.(2009 Reprint)

FLUID MECHANICS

Course Code : 20CV3GCFLM **Credits : 3**
L:P:T:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**
Hours/Week : 03 **Total hours : 40**

Course Objectives

1. Develop an understanding of fluid mechanics and its applications in Civil, Environmental and other engineering fields.
2. Understand and use differential equations to determine pressure and velocity variations in internal and external flows.
3. Understand the concept of Flow measurement through Pipe and Open Channels. Learn to design solve pipe through problems.

Course Outcomes at the end of the course the students will be able to:

	Course Outcome
CO 1	Understand ideal and real fluid flow, fluid friction, principles of conservation of mass and momentum.
CO 2	Apply the Bernoulli equation, control volume analysis, potential flow theory and dimensional analysis to solve problems in fluid mechanics.
CO 3	Analyse laminar and turbulent boundary layer fundamentals and their relevance in practical flow situations.
CO 4	Determine the flow of water through pipes, application of Bernoulli's equation, Major and minor losses in pipes.
CO 5	Analyse the discharge measurement.
CO 6	Solve pipe flow problems including losses due to friction, flow in open channels and flow measurements

Mapping of Course outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	2	2	2									
CO 2	3	1										
CO 3	3	3	2	2								
CO 4	3	2		2								
CO 5	3	2	3									
CO 6	3	1										

Module	Content	Hours	CO's
1	BASIC PROPERTIES OF FLUIDS: Definition of Fluid, properties of fluid: Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension, Bulk Modulus of Elasticity & Capillarity. Newton's law of viscosity. Capillary rise in a vertical tube and between two plane surfaces. Pressure and its measurement. Practical application on capillary rise and properties of fluids	**8**	**CO1**
2	HYDROSTATIC PRESSURE ON SURFACES**:** Basic definitions, equations for hydrostatic force and depth of centre of pressure for Vertical and inclined surface- Problems Archimedes principle, Buoyant force and Centre of buoyancy, Meta centre, Stability of submerged and floating bodies. Problems on total pressure, centre of pressure and buoyancy & flotation	**8**	**CO2**
3	FUNDAMENTALS OF FLUID FLOW: Introduction. Fluid Kinematics – Eulerian approach, Velocity of fluid particles, Types of fluid flow. Stream line, Path line and Streak line, Convective (tangential and normal) acceleration, types of acceleration for different stream line pattern, Rotational & irrotational motions, velocity potential, stream function, definition of flownet. Principle of Conservation of Mass - Continuity equation in Cartesian coordinates, Continuity equation for One-Dimensional flow, Applications. Concept of inertia force and forces causing motion.	**8**	**CO3**
4	ENERGY EQUATION: Principle of Conservation of Energy – Euler's equation of motion, Bernoulli's (Energy) equation, assumptions and limitations, Kinetic energy correction factor, Relationship between Pressure and velocity. Applications of Bernoulli's equation - Free liquid jet, Vortex motion.	**8**	**CO4**
5	FLOW THROUGH PIPES: Introduction. Reynolds's experiment, Laws of Fluid friction. Froud`s Experiment. Darcy's-Weisbach equation. Minor losses in pipe flow. H G L and T E L. Pipes in series – Compound pipe and Equivalent pipe. Pipes in parallel – Bye pas pipe, Branched pipes. Siphon, Transmission of power through pipes, Water hammer in pipes, Equations for pressure rise due to gradual and sudden closure of valves.	**8**	**CO5 CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Unit	Contents of the unit	CO's
1	PRESSURE AND ITS MEASUREMENT:	CO1

	Introduction to Mechanical and electronic pressure measuring devices.	
2	KINEMATICS FLOW: stream tube, Introduction to flow net.	CO2
3	DYNAMICS OF FLUID FLOW: Introduction to Boundary layer theory	CO3
4	PIPE FLOW : surge protection devices	CO4
5	DISCHARGE MEASUREMENTS: Self-recording gauges. Errors in flow measurement.	CO5, CO6

Text Books:

1. A Text Book of Fluid mechanics & Hydraulic Machines- R.K.Rajput, S.Chand& Co, New Delhi, 2006 Edition.
2. Fundamentals of Fluid Mechanics– P N Modi & S M Seth, Standard Book House, 2002

References:

1. 'Principles of Fluid Mechanics and Fluid Machines'- N.NarayanaPillai, Universities Press (India), Hyderabad, 2009 Edition.
2. 'Fluid Mechanics and Turbomachines'- R K Bansal, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.
3. Engineering Fluid Mechanics by D S Kumar, S K Kataria Publications

ENGINEERING GEOLOGY, REMOTE SENSING & GIS

Course Code	**: 20CV3GCGRG**	**Credits**	**: 3**
L:P:T:S	**: 3:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives

1. Study and understand some fundamental and basic concepts of geology, Earth's various processes, events and products & minerals and their uses in civil engineering projects
2. Study of rocks and their uses in civil engineering projects
3. Understand geomorphologic process and hazards
4. Analyse the structural/ deformational behavior of rocks and their impact in civil engineering designing and selection of suitable sites for civil structures.
5. Appreciate the advantages of emerging S&T fields like RS along with their applications in geo-engineering and hydro geological studies.
6. Acquire knowledge to study and interpret the various satellite images with different resolutions and signatures to map different classes of earth features including land use/land cover and other natural resources.

	Course Outcome
CO 1	Determine the origin of the earth, its internal structure, its evolutionary history, chemical composition
CO 2	Describe and Identification of minerals and their uses
CO 3	Describe and Identification of rocks and their uses
CO 4	Know how of earth processes i.e. exogenic and endogenic; geomorphic processes –denudation by running water, weathering of rocks, earthquake, landslides etc.
CO 5	Identify the adverse geological problems during site selections and find the rational solutions
CO 6	Analyse ground water aquifers and their characteristics, geophysical prospecting for ground water, siting of artificial recharge structures.

Mapping of Course outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	1	2										
CO 2	3	2										
CO 3	3	2	3									
CO 4	3	2		4								
CO 5	3	2			5							
CO 6	3	1			5	6						

Module	Content	Hours	CO's
1	**Introduction to Geology and Mineralogy** Definition of Geology and its role in the field of civil engineering; Branches of geology; **Mineralogy**- Classification of minerals- Rock forming minerals and Ore minerals. Physical properties: Habit, Colour, streak, lustre, cleavage, fracture, hardness, diaphenity and specific gravity. Quartz, Feldspar, Mica, Amphibole, Carbonate, Sulphide, Oxide and Sulphate groups	**8**	**CO1**
2	**Igneous, sedimentary and metamorphic Petrology** Igneous petrology: Origin, classification (chemical, textural and depth of formation), mode of occurrence (forms) of igneous rocks with examples. Sedimentary Petrology: Origin, classification (clastic-Rudeceous, Arenaceous and Argillaceous and non-clastic rocks and primary structures-lamination, mud cracks, ripple marks, current and graded bedding in sedimentary rocks with examples, Metamorphic Petrology: Kinds of metamorphism, structures/textures of metamorphic rocks with examples.	**8**	**CO2**
3	**Physical and structural Geology** Physical Geology: Weathering; Types-physical and chemical weathering and engineering significance; origin of soil, soil profile, classification of soil, soil erosion and conservation methods; Geological action of rivers, study of drainage patterns. Earthquakes-causes, effects, and seismic resisting structures. Landslides; causes, effects and remedial measures. Structural Geology: Stress, strain and rock deformation, Geological structures-folds, faults, joints, unconformities and their effects on civil engineering structures.	**8**	**CO3**
4	**Hydrogeology, Geological investigations and remote sensing** Hydrogeology; Hydrological cycle, vertical distribution of subsurface water. Aquifers and their types. Electrical resistivity method for ground water exploration. Methods of artificial recharge of groundwater. Rain water harvesting. Geological investigations; For selection of sites for civil engineering structures-Dams and Reservoirs, Tunnels, Bridges and Highways. Power house, disposal of municipal waste, e-waste Remote Sensing: Introduction to remote sensing and its components – Electromagnetic spectrum – wavelength regions Atmospheric scattering, absorption – typical spectral reflective characteristics of water, vegetation and soil. Sensors and platforms. Satellite Imagery Interpretation. Digital Elevation Models and their Applications.	**8**	**CO4**
5	**Geographic Information System (GIS) and GPS** GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial and nonspatial (attribute) data. Data models –	**8**	**CO5** **CO6**

	vector and raster data – data compression – data input by digitization and scanning. GPS: Basic concepts of GPS, Structure-space, control and user segments. Applications / Numericals of RS and GIS-GPS in Civil engineering		

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	INTRODUCTION: Earth: Its internal structure and composition	CO1
2	PETROLOGY: Schists Rocks as fundamental units and building materials of the earth crust and their engineering application.	CO2
3	GEOMORPHOLOGY AND GEODYNAMICS: Epigene and Hypogene geological agents; study of various landforms	CO3
4	STRUCTURAL GEOLOGY & ENGINEERING GEOLOGY: Power house, disposal of municipal waste, e-waste (SL)	CO4
5	REMOTE SENSING & HYDROGEOLOGY: RS Resolutions & types, types of satellite imagery and their applications in civil engineering, rain water harvesting.	CO5, CO6

Text Books:

1) Parbin Singh. "**Text book of Engineering and General Geology**", Katson publishing house, Ludhiana, 2009.
2) Gokhale, K. V. G. "**Principles of Engineering Geology**", B S Publication, Hyderabad, 2011.

Reference Books:

1) Tyrrell, G. W. "**Principles of Petrology**" Chapman & Hall Ltd, 1978.
2) Todd, D. K. "**Groundwater Hydrology**" John Wiley & Sons, New York, 1980.
3) Billings, M. P. "**Structural Geology**" Prentice Hall, 1972.
4) Ravi, P Gupta. "**Remote sensing Geology**", Springer Verilag, New York.
5) Anji Reddy, M. "**Remote sensing and GIS**", B S Publlications, 2008.
6) Venkata Reddy, D. "**Engineering Geology for Civil Engineering**", Oxford and IBH Publishing company, New Delhi, 1997.
7) Mukerjee, P. K. "**Text book of Geology**", World Press Pvt. Ltd., Kolkatta
8) Lillesand,T.M., Kiefer, R.W. and J.W.Chipman. "Remote Sensing and Image Interpretation" 5th Edition., John Willey and Sons Asia Pvt. Ltd., New Delhi, 2004

BUILDING CONSTRUCTION AND CONCRETE TECHNOLOGY

Course Code : 20CV3GCBCT **Credits : 3**
L:P:T:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**
Hours/Week : 03 **Total hours : 40**

Course Objectives:

1. To determine the mechanical properties of materials used in engineering by performing tests of small specimens of material
2. To conduct material testing in the laboratory equipped with testing machines capable of loading the specimens in variety of ways namely static and dynamic loading, tension and compression, shear and bending, impact loading.
3. To provide basic understanding of the materials used for concrete,
4. To understand the properties, making of concrete, concept of mix design of concrete and its variables
5. To analyze the fresh and hardened properties of concrete and the importance of durability of concrete.

Course Outcomes at the end of the course the students will be able to:

	Course Outcome
CO 1	Discuss the importance of requirements of good foundation, Types of foundations, Preliminary investigation of soil.
CO 2	Assess and compare the different Masonry, Terms used in Masonry, Classification of bricks, Bonds in Brick work
CO 3	Discuss the importance of physical properties of raw materials required to produce concrete of the required specifications
CO 4	Assess and compare the different ingredients of concrete to make a better concrete mix.
CO 5	Explain the making of concrete and design a suitable mix depending on variables and situation
CO 6	Discuss the fresh and hardened properties of concrete,

Mapping of Course outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	2	2	2									
CO 2	3	2										
CO 3	2	2	2									
CO 4	3	2										
CO 5	3	3	2	2								
CO 6	3	2		2								

Module	Content	Hours	CO's
1	FOUNDATION: Function and requirements of a good foundation, Types of foundations. MASONRY AND ROOFS: Brick and stone Masonry. Roofs – Arches, RCC roof, Steel truss	**8**	**CO1** **CO2**
2	DOORS AND WINDOWS: Location of doors and windows, Types of windows and doors, Varieties of materials for doors and windows & their properties. STAIRCASE, SHUTTERING: Types of staircase, design of staircase layout, Shuttering, scaffolding: Beams, Columns, Roofs, Underpinning.	**8**	**CO2** **CO3**
3	CEMENT: Manufacture of OPC by wet and dry process (flow charts only) Test on cement. FINE & COARSE AGGREGATES: Concepts, tests, relative code	**8**	**CO4**
4	WORKABILITY: Basic concepts, Measurement of workability Manufacturing of concrete ADMIXTURES Chemical and mineral admixtures	**8**	**CO5**
5	PROPERTIES OF HARDENED CONCRETE, TEST ON HARDENED CONCRETE CONCRETE MIX DESIGN: Introduction to Concept of Concrete Mix design as per Indian Standard, Numerical examples of Mix Design as per IS 10262 – 2009	**8**	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents**	**CO's**
1	Safe Bearing Capacity of Soil, Deep foundation	CO1
2	Plastering and finishing	CO2
3	Chemical composition, size, Importance - Shape and texture of aggregates,	CO3
4	Factors affecting workability, relationship between compressive strength and w/c ratio	CO4
5	w/c ratio, gel/space ratio, maturity concept, modulus of rupture, Accelerated curing	CO5, CO6

Text Books

1. Building Materials, S K Duggal, New Age International Publications, 2009
2. Engineering Materials, Sushil Kumar, Standard Publication and Distributors, New Delhi.
3. Concrete technology – Theory and practice, M.S. Shetty, S. Chand and Co, New Delhi, (2002).
4. Concrete Technology – A.R.Santakumar. Oxford University Press (2007).

References

1. A Text Book Building Materials, by P.G. Varghese, Prentice-Hall of India Pvt. Ltd., Publication.
2. Properties of Concrete", Neville A.M; ELBS
3. Concrete Manual, Gambhir; Dhanpat Rai & Sons, New Delhi
4. Concrete Mix Design, N. Krishnaraju, Sehgal Publishers
5. Recommended Guidelines for Concrete Mix Design, IS: 10262 - 2016, BIS Publication
6. NBC 2016 code

BASIC MATERIALS TESTING LABORAORY

Course Code	**: 20CV3GLBML**	**Credits**	**: 2**
L:P:T:S	**: 0:1:2:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 30**

Course Objectives:

1. To determine the mechanical properties of materials used in engineering by performing tests of small specimens of material
2. To conduct material testing in the laboratory equipped with testing machines capable of loading the specimens in variety of ways namely static and dynamic loading, tension and compression, shear and bending, impact loading, torsion and hardness testing using commonly used engineering materials such as structural steel, aluminium, copper, wood, brick etc

Course Outcomes At the end of the course the students will be able to:

	Course Outcome
CO 1	Discuss the importance of mild steel bar strength.
CO 2	Assess and compare the different compression, torsion and bending strength on mild steel and wood.
CO 3	Explain the importance of shear and impact test on mild steel.
CO 4	Discuss the hardness property of ferrous and non-ferrous metals.
CO 5	Explain the test on brick and aggregates for finding moisture content, specific gravity.
CO 6	Assess the properties of coarse aggregates – absorption, moisture content, specific gravity, bulk density and sieve analysis.

Mapping of Course outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO 1	2	3	2									
CO 2	3	3	3									
CO 3	3	3	2	2								
CO 4	3	3	2	2								
CO 5	3	2	3									
CO 6	3	1	1	2								

Experiment Number	Content of the Experiment	Hours	CO's
1	Tension test on Mild steel.	3	CO1
2	Compression test of Mild Steel	3	CO2
3	Torsion test on Mild Steel	3	CO2
4	Bending Test on wood & Mild steel	3	CO2
5	Shear Test on Mild steel.	3	CO3
6	Impact test on Mild Steel (Charpy & Izod)	3	CO3
7	Hardness tests on ferrous and non-ferrous metals – Brinell's, Rockwell and Vicker's	3	CO4
8	Test on Bricks	3	CO5
9	Tests on Fine aggregates – Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking	3	CO6
10	Tests on Coarse aggregates – Water absorption, Moisture content, specific gravity, Bulk density and Sieve analysis	3	CO6

References:

1. IS Codes – Tests on Bricks IS:3495 (Part1) 1992
2. Testing of Engineering Materials, Davis, Troxell and Hawk, International Student Edition – McGraw Hill Book Co. New Delhi.
3. Mechanical Testing of Materials, Fenner, George Newnes Ltd. London.
4. "Experimental Strength of Materials", Holes K A, English Universities Press Ltd. London.
5. "Testing of Metallic Materials", Suryanarayana A K, Prentice Hall of India Pvt. Ltd. New Delhi.
6. Engineering Materials by Richards.

SURVEYING PRACTICE

Course Code : 20CV3GLSPL **Credits : 2**
L:T:P:C : 0:1:2:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**
Hours/Week : 03 **Total hours : 30**

Course Objectives:

1. To measure horizontal distances, elevations of points, bearings, etc. using the various instruments

Course Outcomes at the end of the course the students will be able to:

	Course Outcome
CO 1	Assess the distance between two points using direct ranging, pacing, and construct perpendiculars.
CO 2	Construct rectangle, hexagon using tape/chain and compass.
CO 3	Find the bearing of a closed traverse.
CO 4	Assess the distance between two inaccessible points using chain/tape & compass, illustrate the points using radiation and intersection method
CO 5	Assess 3-point problem in plane tabling using Bessel's graphical solution and find difference in elevation between two points using fly levelling technique & to conduct fly back levelling
CO 6	Find difference in elevation between two points using reciprocal leveling and to determine the collimation error, assess conduct profile levelling for water supply /sewage line and to draw the longitudinal section to determine the depth of cut and depth of filling for a given formation level.

Mapping of Course outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	2									
CO 2	3	3	3									
CO 3	3	3	2	2								
CO 4	3	3	2	2								
CO 5	3	2	3									
CO 6	3	1	1	2								

Experiment Number	Content of the Experiment	Hours	CO's
1	To measure the length of survey line and erect the perpendicular by linear and instrument method.	**3**	**CO1**
2	Measurement of bearing of the sides of a closed traverse & adjustment of closing error by angular method	**3**	**CO1**
3	To determine the distance between two inaccessible points using chain/tape & compass.	**3**	**CO2**
4	To carry out the levelling by differential levelling, profile levelling, cross-sectioning, reciprocal levelling and fly back levelling using HI and Rise & Fall methods.	**3**	**CO3**
5	To determine the elevation of an object using single plane method when base is accessible and inaccessible, double plane method.	**3**	**CO2**
6	To set out simple curves using linear and angular methods by theodolite	**3**	**CO4**
7	To set out compound curve and reverse curve using total station	**4**	**CO4**
8	To set out centerlines of columns of a building of a given plan using total station	**4**	**CO5**
9	Demonstration on GPS: Lat-long, altitudes	**4**	**CO6**

Text Books:

1. **Surveying and Levelling** – R Subramanian. Oxford University Press (2007)
2. **Fundamentals of Surveying** - Milton O. Schimidt – Wong, Thomson Learning.
3. **Surveying**, Arther Bannister et al., Pearson Education, India

References:

1. **Plane and Geodetic Surveying** by David Clark Vol 1 and II, CBS Publishers.
2. **'Plane Surveying'** A. M. Chandra – New age international (P) Ltd
3. **'Higher Surveying'** A.M. Chandra New age international (P) Ltd
4. **Fundamentals of Surveying -** S.K. Roy – Prentice Hall of India
5. **Surveying Vol. I,** S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi.
6. **Survey of India Publication on maps**
7. **Text Book of Surveying –** C. Venkataramiah. Universities Press.(2009 Reprint)